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A BOTANICAL JOURNEY IN GREECE IN THE SUMMER OF 1926¹

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Plates 8 and 9

ON the other side of the valley opposite the Kaliakuda which towers above Megalochorio lies its twin brother the Chelidoni with the neighboring village Microchorio at its foot. The valley of the Karpenisi which is rather broad up to this point becomes narrow in front of these connected mountains and the river flows as a torrent through a very narrow deep gorge between the two high mountains. The Kaliakuda and the Chelidoni are limestone, but at their foot flysh-like rock crops out in many places. In the evening we investigated the slopes above the several hundred meters deep gorge of the Karpenisi river. The narrow path is trodden into the easily crumbling slate as an almost impassable "goat walk." The steep rock-slides and the mostly still moving rubble slopes are for the greater part without vegetation. Here and there solitary suffruticose Labiatae and Compositae and also a few herbs have gained a foot-hold. Farther up, however, where the slopes become less steep, they are covered with Fir forest which here and near its lower limit also is mixed with Oaks; the Oaks are often infested with Mistletoe.

After our return to Megalochorio we decided to try to get information from the natives regarding the occurrence of the Horse-chestnut as we did not care to rely entirely on chance to find this rare and local tree. For this purpose it is very helpful that all male inhabitants as soon as it becomes known that strangers have arrived, flock together in the only "kaphenion" of the village, and thus we could hope to find some one who could give us the desired information. But all questions seemed to be in vain. There are two names in Greek for *Aesculus Hippocastanum*: Horse-chestnut (ἵπποκαστανά) and wild Chestnut (ἄγρια καστανά). The first name is often unknown, and in regard to the second one is never sure whether people who profess to know the tree have not in mind the wild form of *Castanea vesca* which occurs not rarely in the woods. Mr. Schulz tried to make the matter clear by sketching a flowering branch, but no one knew the tree, only our host said that he had seen the tree during a visit to Constantinople, but in this neighborhood it did not

¹ Continued from p. 149.

exist. We had almost given up hope when a laborer, who had been silent during the whole discussion, finally said that he knew the tree and knew a gorge near the village, about one hour's distance, where the Horse-chestnut grew. He offered to guide us the next morning, Sunday, to the spot. Though shepherds, who were grazing their flock in that region, had assured us that afternoon that Firs and nothing but Firs grew there, the man to our delight proved to be right.

We ascended the steep slope at the foot of which the village is situated and continued along the rim of the gorge of a tributary of the Karpenisi river. The rubble slopes are at first as bare as those visited the day before, but soon we reached a beautiful Fir forest which covers all the slopes above the gorge; at first it is mixed with a few Oaks, but soon becomes almost pure. The Firs we examined were fairly typical *Abies cephalonica* without hairs on the young branchlets. Soon after entering the dense forest we left the path and turning to the right soon reached the rim of the gorge which is about 15-20 m. deep with very steep sides and covered by a dense canopy of leaves: Linden, Hornbeam and Flowering Ash grow on the steep walls of the gorge, while the more open places near the rim are occupied by dense scrub of *Quercus coccifera*. Soon we spied the dense crown of the first Horse-chestnut though without fruit, but farther on we found a tree covered with its spiny fruits but unfortunately not yet ripe. The Horse-chestnut forms here not solitary stout trunks, as we see them in our parks, but each tree consists of many, rather slender, straight, upright stems. Since we intended to explore the gorge of the Karpenisi river itself, we returned to the village.

From Megalochorio we followed first the road to Mikrochorio, but after crossing the bridge we took, on the other side, the road toward the south and crossed first the rather broad and stony bed of a little brook coming from the Chelidoni Mountain. Its bed like that of the river is occupied by Plane trees accompanied chiefly along the Karpenisi River by three or four species of *Salix* which occasionally ascend the slopes. The road which kept from Karpenisi up to here only slightly above the bottom of the valley, begins quickly to ascend when the valley becomes narrower. The slopes before the beginning of the real gorge consist of looser or finer rubble or of primary rock, partly limestone and partly sandstone. They sustain, according to their nature, either a poor rubble vegetation or more often a very luxuriant šibljak formation of deciduous shrubs with a large percentage of evergreen elements: *Ostrya duinensis*, *Quercus coccifera*, *Q. conferta*, *Q. lanuginosa*, *Pistacia Terebinthus*, *Coronilla emeroides*, *Corylus avellana*, *Phillyrea media*, *Juniperus Oxycedrus*, *Podocytisus* (particularly on the rocks), *Tamus communis* and occasionally a few Willows; even some gnarled trees of *Abies cephalonica* are found in this already varied association. No room is left in this dense scrub for herbaceous plants; these are restricted to the loose rubble slopes. Soon we reached the narrow gorge with its very steep walls into which the road

has been blasted. The rocks are partly without vegetation, but in the crevices and on small ledges some Composites, Labiates and Caryophyllaceae represented by few species but usually many individuals have gained a footing. After a short distance the gorge expands again and we enter a very attractive but very hot and dry valley grown over with low evergreen maquis or phrygana vegetation which seems to consist of the usual elements. Extensive land-slides occurred apparently not long ago, for one sees large stretches of fresh rubble not yet covered with vegetation. Here we turned since we had a walk of eight hours back to Karpenisi which we reached late in the evening half starved and nearly parched from thirst.

On the fourth of August we succeeded in obtaining pack animals for our long planned excursion into the Oxya Mountain (Oxya is the Greek name of the Beech). The road leads first over the immense talus-cone of the Tymphrestos and then through the end of the Karpenisi valley to Laspi where we leave the road and take a path which leads over a rather steep slope to the pass through beautiful Fir forests with scattered Chestnuts. Much more common are the Chestnuts on the opposite slopes above Laspi which are exposed to the north. In this Fir forest we made the important observation that here, and also in the other Fir forests which we were to see today and tomorrow, the same variations occur as we had observed in the forest of Stenoma. Also here we had the impression that we had a population of hybrids before us.

Shortly before the pass we regain the road, but leave it again at the highest point of the pass at about 1240 m. altitude to follow toward the South the broad ridge which leads to the summit of the Oxya Mountain. First we cross a meadow where innumerable sheep are grazing and then we enter another beautiful Fir forest. In these forests the ground is densely covered for miles with *Pteridium aquilinum* which does not allow the growth of anything else. The Fir forest itself is now pure, for the Chestnut does not reach these altitudes. Between 1500 and 1600 m. the forest becomes more open and soon is left behind altogether. We gain now an unrestricted view over the immense broad ridge from which a few mountains and even the summit itself rise only slightly higher. The whole ridge is covered with a carpet of grasses and herbs and cushion plants; large stretches scattered everywhere are noticeable on account of their bright green color and turn out to consist of *Pteridium aquilinum* which thus occurs also above the tree-line in great quantity. Low shrubs appear here only rarely: *Genista acanthoclada*, *Daphne oleoides*, *Astragalus*, *Crataegus* sp. (cf. *C. Heldreichii*), *C. monogyna* and *Juniperus Oxycedrus*. The rocks consist of slate and sandstone, and these in general are poor in plants, at least at this season, and, moreover, everything is much browsed. Magnificent views present themselves over the mountains of central Greece, the Veluchi, Chelidoni, Kaliakuda, Vardussia and the high mountains behind toward the Parnassos.

On the eastern slope of the ridge, Fir forests ascend in a groove-like gorge to a higher altitude and above one recognizes, easily noticeable on account of the lighter green, small stands of deciduous trees which can be nothing else but Beech, the first *Fagus sylvatica*. As soon as we have rounded the small elevation which hitherto had obstructed the view, we see in the distance the southernmost slopes of the mountain below the summit, exposed to west and northwest, covered with immense Beech forests. After an hours' walk we reached the forest and found on examining fruiting trees that this Beech does not differ in the least from the *Fagus sylvatica* of middle Europe. Apparently no other trees are associated with the Beech, at least one can discern nothing differing in appearance, and as the interior of the forest is said to be impenetrable, we must assume that shrubby undergrowth is lacking. Regarding the habit of the trees, it is particularly noticeable that none of the trees form the mighty trunks which we are used to seeing in our northern Beech forests. Each individual consists of a more or less large number of virgate spreading slender stems forming a 7-10 m. high bushy tree. This we could ascertain only of the outer rather open part of the forest, but apparently it applies to the whole forest as the trees do not seem to reach a greater size farther toward the interior; also the stated impenetrability can be explained by the bushy habit, for it is hardly possible that a Beech forest harbors a dense undergrowth of shrubs. The question now is whether this habit is caused by some natural influence or by continuous exploitation. As forest devastation is very great in all countries of the Balkan peninsula, one would be inclined to consider this as the cause of the habit of the trees. This assumption, however, presupposes the nearness of large settlements or at least the presence of good roads which would allow the carrying away of the timber. As both are lacking here, this cause is very improbable and seems still more so, if one compares these Beech forests with bushy Beech woods in the north of the Balkan peninsula which owe their present state to constant exploitation. Such woods I saw in 1924 frequently in the middle Rhodope mountains in Bulgaria. Larger trunks are entirely lacking there; the wood is a tangle of slender stems hardly exceeding 3-4 m. in height and forming quite impenetrable thickets. The stems of the Beeches in the Oxya Mountains, on the contrary, attain mostly to the thickness of an arm or leg and even more, and thus they appear more tree-like. All this leaves little doubt that the habit of the Beeches in the Oxya Mountains, as it is now, is also their original and natural habit. Therefrom we may deduct that the Beech is unable here in its most southern locality to form the high forest so characteristic of this tree farther north; probably it is too dry and too hot. Therefore, it chooses here the comparatively cool and moist localities, that is the upper regions of the mountains, for the zone of the Beech is above that of the Conifers and constitutes at the same time the tree-line. From the summit ridge of the Oxya Mountain one can clearly observe how the

Fir zone lying deep below is nearly without transition replaced by the extensive Beech zone. This separation of the regions starts already in Macedonia, but is not so clear there, since *Pinus nigra* or *P. Heldreichii* often follows the Beech.

As this excursion in spite of its extension did not yield very much for our collection in regard to numbers, we made the following day, from the village of Gardiki where we spent the night, a wide detour to visit the forest of Muntzuraki often cited in literature. From Gardiki we went at first northward down a steep slope toward Punghakia. The slope is covered with an open, much exploited Fir forest, but soon Chestnuts begin to appear again in the forest. The valley is cultivated and between the fields we noticed several species of Oak. Then we walked downhill and uphill now through the Firs and now through fields. Everywhere are Chestnuts and Walnuts and the mountains above are covered with Firs. Punghakia consists of two villages separated by an hour's walk; above the second village we ascend the steep heights which bear the forest called Muntzuraki. This is, indeed, a very beautiful forest which partly consists of a mixture of Fir and Chestnut and partly of Firs alone. A slope covered with such mixed forest was destroyed by fire about ten years ago and in its present condition shows well the advantage of deciduous over coniferous trees. Though the capability of regeneration is much more developed in *Abies cephalonica* than in *A. alba*, it is not such as to allow burned down stumps to produce new shoots. In case of forest fire this Fir regenerates only by seeds, but young trees were very rare on this burned over slope; probably it had been up to now too dry and too sunny. The Chestnut, however, had formed abundant coppice and the whole slope was covered with a tall shrubby growth. These Chestnut bushes had the same appearance as the Beeches on the Oxya Mountain, but with the difference that each many-stemmed individual still showed in the middle the old charred stump surrounded by the new shoots which already bore flowers. The whole forest, therefore, has become now a rather open brushwood of Chestnut.

Through a mixed forest of Fir and Beech above the burnt area we ascend to a ridge which is an eastern spur of the Oxya Mountain. This mixed forest extends up to the top of the ridge in a grandeur hardly seen elsewhere, so that one did not know whether one should admire more the gigantic proportions of the trees or the density and vastness of the forest. As soon as one has crossed the summit of the ridge (1450-1500 m.), the Chestnuts disappear. Hence they apparently reach only on southern slopes such high altitudes, while on northern slopes such as we now descend, they reappear much farther down. The pure Fir forest which follows is no less imposing for it also consists partly of beautiful old trees. It may be stated that here also the Firs are represented by different forms, with glabrous or pubescent branches, acute or obtuse leaves, either radially spreading or more or less pectinate. The only admixture we saw in this

forest was a beautiful specimen of *Ilex Aquifolium*, a species which we had not encountered before. Heldreich, Halacsy and Chloros record in the forest of Muntzuraki several other trees which we, however, did not see. The forest is very extensive and it is probable that these trees occur in the lower regions of the eastern part of the forest.

Numerous smaller and larger brooks which flow into the right arm of the Spercheios cut into the ridge of Muntzuraki on its northern side. These gorges are accompanied by a broad growth of beautiful old Plane trees which often ascend the slopes of the gorges and invade the Fir forest. Under these conditions the Plane reaches an altitude of nearly 1400 m.

We descended in westerly direction to the Oxya ridge and following the road below the ridge we reached the pass from which we had started the day before. Here at the altitude of 1250-1300 m. the Fir forest ends and the slope of the ridge is covered with a rather meagre growth of *Juniperus Oxycedrus*. From the pass we returned by the road already described to Karpenision. The excursion was phytogeographically very interesting, but floristically it did not prove so profitable as we had expected. As we could not expect to find any more important woody plants near Karpenision, we left this place on the ninth of August for Saloniki by the way of Lamia and Larissa.

From Lamia the railroad cuts through the western spurs of the Othrys Mountains which are covered with a maquis formation similar to that seen in the Thermopyles, but the great amount of the wild form of *Olea europaea* was remarkable. Then we descend into the wide plain of Trikkala which constitutes an immense pasture and affords beautiful views of the high mountains of the Pindus range. After crossing a broad range of hills covered with meagre vegetation we reach the plain of Larissa which is entirely under cultivation.

From a visit on the following day to the Tempe valley, which has been so much praised for its scenic beauty and botanical interest, we expected much, but as it often happens such glowing descriptions evoke too great expectations. We were somewhat disappointed, particularly as we had seen in the gorges near Triklia, in the Klissura near Aetoliko and in the chasm of the Karpenision river near Megalochorio, gorges which surpass the Tempe valley in scenic beauty and partly also in botanical interest. Nevertheless the Tempe valley is a beautiful, well wooded gorge, now narrower and bordered by steep cliffs, now wider with gently sloping sides. The tree growth along the river itself is very luxuriant and consists of *Platanus orientalis*, *Populus alba* and *P. nigra* and several species of *Salix*; the slopes are often covered with a dense growth of *Quercus Ilex*, *Q. lanuginosa*, *Ficus Carica*, *Punica Granatum*, *Paliurus aculeatus*, *Vitis* sp. (probably *V. silvestris*). These notes are based on observations from the train. The railroad after leaving the Tempe valley turns to the north and follows the small strip of land between the Olympus mountain

and the sea. The landscape for wide stretches consists of the talus-cones of the eastern foot hills of the mighty Olympus massif and is characterized by a vegetation of šibljak-like formations and maquis of *Quercus coccifera*. *Paliurus aculeatus* is very common and dominates wide stretches. Next we crossed the extensive Vardar swamps devoid of tree growth and soon reached Saloniki, which was to be our head-quarters for several weeks and the base from which we intended to visit the Athos peninsula and Thracia. As the time at our disposal was too short to visit both the Olympus and the Athos mountains we selected the latter, because botanically it is less well known than the former. In the evening of August 19 we left Saloniki by boat and arrived the next morning in Daphni, the port of the Holy Mountain "Hagion Oros." This forms within the Greek State a republic of monks with its own government and administration. To be allowed to enter this republic we had received from the Department of Education in Athens a letter of recommendation which was exchanged by the Holy Synod residing in Karyes, the capital of the republic, for a letter of introduction to the monasteries which constitute the republic and of which there are twenty. Without such a letter of introduction by the Holy Synod no one is admitted to any of the monasteries. On the way from Daphni to Karyes we were struck by the luxuriance of the vegetation as well in the maquis formation as in the mixed woods above. Not only are the trees and shrubs represented by many species, but also the species are present in a large number of individuals and the latter as a rule are well developed.

The maquis formation is a mixture of great variety without a dominant component. The chief constituents are: *Laurus nobilis*, *Quercus coccifera*, *Q. ilex*, *Phillyrea media*, *Olea europaea* (the wild form), *Cercis Siliquastrum*, *Pistacia Terebinthus*, *Fraxinus Ornus*, *Spartium junceum*, *Arbutus Unedo*, *Osyris alba*, *Rubus* sp., *Erica arborea*, *Smilax aspera*, *Clematis*, sp., *Ephedra campylopoda* (between Daphni, Xeropotamu and Russikon very common, but not observed on the east slope); near the monastery Russikon we noticed trees of *Arbutus Andrachne* which is here very rare; *Quercus lanuginosa* occurs occasionally, but becomes more common higher up. In the gorges *Platanus orientalis* forms a beautiful growth. There are few herbs, but we notice the first flowers of *Scilla autumnalis* which remind us that autumn is near. Toward Russikon the maquis has been cleared and the monks have planted Olive-trees; also Figs are much planted in this region.

At 300-350 m. altitude a small fiat ridge projects from the main ridge toward the west. It is in places covered with a nearly pure bushy growth of *Quercus conferta* mixed with a few *Q. lanuginosa*. But here much wood has been cut and it seems as if the Oak vegetation owes at least its pureness to the influence of man. Another small neighboring ridge bears a rather large stand of *Pinus nigra* of which scattered individuals can be observed also at the border of the Oak region; and strange enough

one observes among the *Pinus nigra* solitary trees of *P. halepensis*, a mixture which I have not seen elsewhere and, moreover, the occurrence of *P. nigra* at such a low altitude is surprising, for on the Athos mountain itself it is not found much below 1000 m. altitude. *Pinus halepensis*, however, belongs in this region, but it is rather rare on the Athos peninsula and we never saw it forming forests. On the west coast these trees were the only individuals seen, while on the east coast we found only scattered trees southwest of Iwiron not far from the spring of Sanct Athanasios in the maquis formation.

On the upper margin of the Oak bush mentioned above, the first trees of *Castanea vesca* begin to appear which gradually increase and form large forests. These forests are very rarely pure, but are nearly always mixed with at least a few Firs. On the lower limit one notices also some *Pinus nigra* between the Chestnuts, but occasionally the Firs predominate, and on the slopes south of the road from Daphni to Karyes we find nearly pure Fir forests. On the eastern side the mixed forest extends to immediately above Karyes (about 400 m. altitude). On this side, above Karyes, we had, on several occasions, the opportunity to examine this forest more closely. One notices at once, and this is somewhat disappointing, that it is not a virgin forest. As after the war the subventions which the monasteries received from the government ceased, the monks were forced, more than before, to obtain revenues from the forest by the sale of timber. This is done partly by the manufacture of charcoal and partly, as we were informed, by cutting the wood every twentieth year. Afforestation, of course, is not practiced. The Chestnuts are cut down completely, while of the Firs some trees or all of them are left standing, whether as seed-bearers or because the wood is less in demand, I have not been able to ascertain. The Chestnuts soon form new sprouts which grow very rapidly and flower and fruit after a few years. In the middle of a circle of slender stems the stump of the old felled tree remains visible for a long time. Thus the whole forest has in its general appearance much resemblance to the burnt slope in the forest of Muntzuraki described above. The Firs regenerate by abundant seedlings in all stages from very young plants to mature trees.

Though Fir and Chestnut are here the dominant elements, they are not the sole constituents of the forest as in the southern Pindus. It is not surprising that *Platanus orientalis* ascends here in the gorges to the elevation of these forests. Other accessory elements are *Acer Pseudoplatanus* and *Quercus Ilex*. According to Grisebach, *Fagus sylvatica*, which he observed gregarious on the western slopes of these mountains farther south, is supposed to occur also in the forest above Karyes. But we looked there in vain for it. It is, however, its profuse and luxuriant undergrowth that distinguishes this forest more than anything else from all those seen before. *Ilex Aquifolium* is often present in such abundance that the forest becomes impenetrable. In its spiny character it is assisted

by *Ruscus aculeatus* and *R. Hypoglossum* which often cover the forest floor completely and leave no room for anything else. Also *Quercus Ilex* appears, often only as shrub. More locally restricted are *Pyrus* (*Sorbus*) *torminalis*, *P.* (*Sorbus*) *domestica*, *Sambucus nigra*, *Corylus* and *Daphne*. On somewhat more open places the forest is invaded by elements of the maquis and the Oak region, such as *Fraxinus Ornus*, *Quercus lanuginosa*, *Q. conferta*, *Cytisus* (two species) and along the roadside *Laurus nobilis*. In moister and less densely wooded gorge-like hollows a species of *Rubus* often forms a dense tangle and passes into lianas, for it climbs into the trees up to nearly 10 m. high. Two other vines which we observed were *Hedera helix* and *Clematis*. Of the herbs which were mostly out of bloom at this time, I may mention *Cyclamen hederacifolium* whose flowers were appearing everywhere. The profuse development of Ferns indicates the great amount of moisture prevailing in these forests.

Karyes itself is situated near the lower limit of this forest toward the maquis formation, but this is somewhat obscured by the fact that here felling and clearing has been extensively practiced. Along the road-sides the maquis elements mentioned above for the more open parts of the forest penetrate rather far upward. Below Karyes, however, elements of the forest flora are lacking and a luxuriant maquis formation prevails. This is on the whole very similar to the maquis on the west side, but shows some differences, as the absence of *Ephedra campylopoda*, and the occurrence in great masses of *Erica arborea* and species of *Cistus*, but I do not wish to emphasize these facts, since our sojourn there was too short to find out whether these were not accidental impressions caused by the comparatively small number of localities visited.

A common feature of the maquis of the east and the west side is certainly this, that here, as is often the case on the continent, not a single species prevails, but that the whole formation represents a rather uniform and varied mixture. The characteristic elements are: *Quercus coccifera* in many different forms, of which some seem to be restricted to certain regions, *Arbutus Unedo*, *Erica arborea*, *Phillyrea media*, *Quercus Ilex*, *Spartium junceum*, *Osyris alba*, *Smilax aspera*, *Calycotome*, *Cistus* (two species). In addition deciduous elements also play at the upper limit an important part such as *Quercus conferta*, *Fraxinus Ornus* and *Lonicera*, while at this time only few herbs are still to be seen. Farther down toward the sea the deciduous elements gradually disappear, and *Erica verticillata* and a third *Cytisus* enter.

In regard to the Chestnut and the Fir some observations may be recorded. The *Castanea vesca* of the woods is the wild form, for we were told, that the fruits of these trees are not edible and that the monks use only the wood. But this is contradicted by the statement of Fallmerayer who visited the Athos mountain in autumn, that the monks gather and eat the fruits of this tree. At the time of our visit the fruits were still too young, so we could not decide this question.

About the Firs of the Athos Mountain heretofore little was known. Some believed that it is *Abies cephalonica*, others considered it *A. alba*, and still others assumed that according to Grisebach's statements the two species occurred on the Athos peninsula. The Firs in the forests above Karyes show a similar variety of forms as observed near Karpenision, but with some further deviation. Pungent leaves can hardly be found, even if some leaves may be called pointed; very often they are rounded at the apex and sometimes a distinct emargination can be observed. Generally one has the impression that the influence of *Abies alba* is here much greater than in the southern Pindus; also the buds are often only slightly resinous. The trees are one-stemmed; gnarled and branched trunks are not obvious; the position of the leaves varies between that of *A. alba* and *A. cephalonica*. These variations will be studied in detail on the collected herbarium material.

From August 25 to 28 we made a four days excursion to the summit of the Athos. On the first day we rode from Karyes by Iwiron and the spring Hagios Athanasios to the monastery Lawra, the second day by Kellia Kerasia to Athonos Panhagia and ascended the summit. We returned by the same way to Karyes. Grisebach has described this tour in great detail.

Until Lawra is reached one remains always in the maquis region. The road leads all the time down hill and up hill, as numerous valleys and their separating ridges have to be crossed, though the altitudinal differences amount to hardly more than 200 m., but in spite of that the aspect of the vegetation varies greatly. A very high and at the same time very dense and therefore impenetrable maquis formation prevails of a luxuriance such as observed by me nowhere else in Greece. Although the composing elements are always the same, they are rarely observed in such completeness as here. *Quercus Ilex* is hardly ever lacking, but *Q. coccifera* does not play its usual prominent part; it covers some slopes, but in many instances it is only sparingly represented and frequently it is entirely lacking. *Phillyrea media* is sometimes a small tree. One of the most common elements is *Laurus nobilis*, but it is not found on the drier slopes. *Arbutus Unedo*, on the contrary, is more evenly distributed, while *A. Andrachne* is lacking entirely. *Erica arborea* is no less common, but often grows together with *E. verticillata* which also forms stands by itself and is now in bloom. *Juniperus Oxycedrus* and *Myrtus communis* are restricted to the hottest and driest slopes. Other elements of more or less importance are: *Quercus lanuginosa*, *Q. conferta*, *Q. cf. sessiliflora*, *Cercis Siliquastrum*, *Ostrya*, *Pistacia Terebinthus*, *Olea europaea*, *Ficus Carica*, *Fraxinus Ornus*, *Coronilla emeroides*, *Rubus aculeatus*, *Paliurus aculeatus* (very sporadic), *Osyris alba*, *Lonicera*, *Spartium junceum*, 3 species of *Cistus*, *Rosa* sp., *Cytisus* sp. and *Hypericum* sp. The whole is entwined by a many-stemmed tangle of vines which makes it quite impossible to penetrate this formation. The worst of these is *Smilax aspera*, now in places studded with its red

berries. A climbing Rose (*Rosa* cf. *sempervirens*) is not rare but much less armed than the Smilax. *Vitis sylvestris* often covers its host entirely with its luxuriant foliage; its small blue berries are somewhat acid, but refreshing to the parched throat. Everywhere one sees the white wigs with which two species of *Clematis* adorn the bushes of the maquis, and more modestly *Tamus communis* creeps between, while *Hedera helix* is found more often in rocky places, but also climbs high trees or trails plentifully between the shrubs. *Humulus lupulus* like *Vitis* prefers moister localities.

The interior of this maquis formation is so dense that the lack of light makes the development of herbaceous vegetation impossible. Only along the roadside some herbs are blooming, while at a more favorable season the more open places are adorned with a fairly abundant herbaceous growth.

The very diversified territory with many now broad now narrow and channel- or gorge-like valleys and the intervening ridges which in the middle of their course are often gently sloping, but toward the sea drop abruptly by precipitous cliffs or slant more gently, results in a greatly varying development of the maquis formation and also affords opportunity for other formations to gain a foothold. A few of these small valleys expand at their mouth into a 20 to 30 m. wide bottom kept moist by a brook which carries water all summer. In consequence a dense stand of high *Alnus glutinosa* develops interspersed with *Platanus orientalis* beneath which in the humus *Osmunda regalis* luxuriates. Mostly, however, the valleys are narrow and the slopes slant down to the brooks, so that no swamp is formed. Instead of the Alder woods the forest of the next higher region extends under these conditions farther down, almost to the sea. The presence of the forest in the maquis region can be explained by local climatic conditions caused by the moist gorges which are protected by the adjoining ridge running from west to east from the full action of the southern sun; for this reason it is chiefly the slopes of northern exposure which bear this forest. As in the upper region *Castanea sativa* is also here the dominant forest tree, but there is a great difference in so far that in this forest which breaks like a wedge through the maquis region, the Fir, the second important component of the upper forest, is lacking entirely. In its stead *Quercus Ilex* plays a much greater part. Besides one sees, though more rarely, *Acer Pseudoplatanus*, *Tilia* sp., *Pyrus* (*Sorbus*) *torminalis* and *P.* (*Sorbus*) *domestica*, and of elements of the maquis *Laurus nobilis* as undergrowth.

The cliffs near the coast by which the ridges drop to the sea bear besides several beautiful perennials (*Silene*, *Cineraria*, *Plantago*, *Armeria* and *Umbelliferae*) often in great quantities a shrubby *Chamaepeuce* which we had seen already at the west side on cliffs near the monastery Xeropotamu.

Exposure has also apparently much influence on the composition of

the maquis formation. One can observe that the slopes of southern exposure which are higher or jut out farther toward the sea and therefore are exposed to the full sun, are covered with a comparatively poor and low *Quercus coccifera* maquis including *Phillyrea media* and *Myrtus communis*. In such a locality we also saw a few trees of *Pinus halepensis*.

Late in the afternoon we arrived at the Lawra monastery where we stayed over night. The neighborhood of the monastery is entirely cleared and planted with fruits, grapes and vegetables. In the court of the monastery are still standing the old Cypress trees mentioned by Grisebach and which, if his estimate is correct, must now be about 1100 years old.

The following day we ascended from Lawra (65 m. alt.) by the way of Kellia Kerasia (700 m. alt.) and the Athonos Panagia (1354 m. alt.) to the summit (1935 m. alt.) of the Athos Mountains which gives the name to the peninsula. This mighty massif rising abruptly from the sea consists of marble, while the largest part of the "Holy forest" has mica-schist as a substratum with scattered islands of marble. The road leads in southern direction gradually ascending first through a rather meagre *Quercus coccifera* maquis apparently burned over a few years ago. It also contained a few solitary *Fraxinus Ornus* and *Phillyrea media*; *Euphorbia acanthothamnus* is common, and Grisebach also mentioned *E. dendroides*. This maquis is occasionally cut by the monks, as we noticed near Karyes. They, however, do not cut down everything without discrimination, as it is often done by others and may perhaps be the rule, but the monks take out only the scrub (*Erica arborea*, *Quercus coccifera*, *Cistus*, *Calycotome* etc.) and leave the many small stems of *Quercus Ilex*, *Fraxinus Ornus* and *Arbutus Unedo* standing. What the purpose of this procedure is, I could not find out; perhaps they expect to raise in this way a high forest.

Gradually the road ascends to higher altitudes, and we reach a skiti (a small settlement of monks) which is situated in a small but high-stemmed grove of *Quercus Ilex* and *Q. lanuginosa*. The slopes around this skiti are formed by large moss-clad boulders with a luxuriant maquis between them of similar composition as that between Lawra and Iwiron. Somewhat higher appears again a meagre vegetation of *Quercus coccifera*. At about 600 m. altitude, however, the vegetation changes abruptly, when we cross a projecting ridge by a small pass adorned with a chapel, and the direction of the road changes from south-south-east to west or west-north-west. Directly behind the pass we were greeted by some beautiful tall-stemmed *Acer monspessulanum*, but the high forest cannot yet attain to a full development. The very steep hot slopes are covered for a short distance with a maquis vegetation which, though rather high and often forest-like, is very open on account of numerous scattered fragments of rock. *Quercus coccifera* and *Phillyrea media* form 4-5 m. high bushy trees and show a great variability in the shape of their leaves, so that the species are often difficult to recognize. Between them appear

deciduous shrubs in greater quantity than in the lower maquis, though they are mostly the same species, as *Carpinus*, *Fraxinus Ornus*, *Acer monspessulanum*, *Quercus lanuginosa*. Besides these *Juniperus Oxycedrus* and also *Arbutus Unedo* are frequent, but of the rarer *A. Andrachne* we noticed only a few bushes. The whole region is a field of struggle between the high-forest which begins above and the gradually disappearing maquis formation. In this locality, however, one cannot get a clear insight into this transitional region, since charcoal burners are here working and have already over a wide area cut all serviceable wood. For centuries the manufacture of charcoal, which in Greece is the customary fuel, has been going on on the Athos peninsula. Without doubt the charcoal burner often has to change to other localities and thus continually destroys new maquis and woods.

It is obviously very difficult to gain, after such a short sojourn as allowed us, a clear idea how deep a change this kind of exploitation causes in the vegetation and how the exploited wood formations react after being again left to themselves. Sometimes I had the impression that the meagre *Quercus coccifera* maquis was not always caused by natural conditions, but by the manufacture of charcoal, since on such places evidence of man's destructive activity could often be found. In consequence of these circumstances the high forest begins rather abruptly at an altitude of 650 m. Two not very distant springs give to this place the name "Cold Waters" (Kryo nero or Krya nera). Soon one reaches the vigorous springs near the Kellia Kerasia (about 700 m. alt.), while higher up no more springs are found, and one has to depend on a few cisterns which, however, this year contained only a little water unfit to drink.

The forest region occupies the zone between 600–650 and 1500–1550 m. altitude, but individual trees ascend to 1600–1650 and according to Grisebach to 1700 m. The differences in the altitudes, however, and the varied topographical configuration produce the most diverse pictures of forest vegetation. Right at the beginning between the springs and the Kellia Kerasia is a rich and luxuriant mixed forest whose predominant elements are *Castanea vesca* and *Abies*, but with a frequent admixture of *Populus tremula* which is entirely lacking in the forest above. Also *Acer pseudo-platanus* is not rare. These are all the more important forest trees. In the beginning there are also handsome tree-like *Quercus Ilex* interspersed, while *Q. lanuginosa* prefers the more open places. Of the woody plants which we had already noticed in the lower regions a few remain faithful to the whole or to the larger part of the forest region; these are *Fraxinus Ornus*, *Carpinus*, *Acer monspessulanum*, *Quercus lanuginosa* and *Juniperus Oxycedrus* which occupy particularly the open sunny places. More characteristic of the forest proper are *Pyrus* (*Sorbus*) *torminalis*, *P. (Sorbus) Aria* and *P. (Sorbus) domestica*, of which the first two ascend to the upper Fir forest (about 1350 alt.), while all three occur also in the wedges of the forest referred to above which extend into the

lower maquis region. Of evergreen woody plants only two are native to this forest, namely *Ilex Aquifolium*, which usually occurs as undergrowth, but also grows up not infrequently into good-sized trees, and *Hedera helix* which clutches with thick old stems the trunks of trees. Other undergrowth is very sparse in the dense forest, here and there an *Evonymus* or a *Sambucus nigra*. In the clearings, however, *Rubus*, *Rosa*, *Crataegus*, *Sambucus nigra* and *S. Ebulus*, *Juniperus Oxycedrus* and *Pteridium aquilinum* form, entwined with *Clematis*, real thickets.

The development of the forest, however, in this luxuriance is apparently possible only in the gorges and valleys, as is the case round the Kellia Kerasia. From the first spring of the Cold Waters one obtains a good view of these conditions, as one can overlook the whole wooded gorge and the slopes up to the summit. One sees the whole forest which in its upper contours is very irregular. Above it rise mighty ledges which for edaphic reasons cannot support a luxuriant forest, but bear in the crevices a loose scrub of *Fraxinus Ornus* and *Carpinus duinensis*. Below the summit one recognizes finally an open, pure Fir forest. But also the more rounded ridges do not support that forest, as we shall see when continuing the ascent. The road leads through forest only up to 200 m. above the Kellia Kerasia. The Fir is here very common and often forms pure groups and stands. It is, however, mostly accompanied by the deciduous trees mentioned above, of which *Castanea vesca* becomes sparser. At about 900–950 m. altitude the forest ends with a few groups of Firs, and evergreen scrub of *Quercus coccifera* takes its place mixed with the deciduous elements of the maquis formation. The slope is steep, hot and dry; this causes the sudden and unexpected change. Also this growth is small, for soon we have to cross an immense field of large blocks of marble apparently of recent origin; between the block only a few herbs and perennials have established themselves, but no woody plants are found yet. This field of detritus covers the crest of a ridge, on the other side of which is a small bare valley and again a ridge with gentler rounded slopes covered with soil, but the beautiful forest does not reappear here and instead we find a small grove of *Pinus nigra* (at about 1000–1100 m. alt.). Except this grove we saw on our way only solitary trees of this Pine. Grisebach must have taken the more easterly road to the Athonos Panagia, for he states that after crossing the rich mixed forest he traveled some time through a pure forest of *Pinus nigra*. This forest we noticed later from above.

Also the ridge on whose crest the road continues for a short distance bears no continuous forest. Meadows spread out and one sees some scattered small groves; *Castanea vesca* appears very sparingly, but most of the ground is occupied by a mixed shrubby growth of the usual often named species. At about 1200 m. altitude we reach the end of a valley of a small brook and we climb up on its right slope. Here we find unexpectedly on a hot and dry slope covered with large boulders of marble

once more an extensive growth of *Quercus coccifera*. Hardly 50 m. higher up the valley becomes narrower, but its bottom is nearly flat and bears a mixed Fir forest somewhat reduced but still well developed.

From the preceeding brief statements a separation of the vegetation of the Athos mountain into distinct regions which are certainly chiefly due to climatic influences can be recognized. But one also notices that the very uneven territory creates in close proximity different local climates due to edaphic conditions and this disturbs considerably the normal zoning of the vegetation. We have seen already that in favorable gorges the forest extends down to the sea, while on the other end the maquis formation, at least as a growth of *Quercus coccifera*, appears at the upper limit of the forest region even without being connected with the regular maquis zone. Inversely one may state, that the presence or absence of a formation of a certain zone is to a certain extent due more to topographical conditions than to altitude. Above the Fir forest mentioned above in which charcoal burners have established themselves, the valley ends with steep slopes but extends still to Athonos Panagia. On the ridge to the right the forest of *Pinus nigra* can be seen and between many stands of *Populus tremula* at about 1300 m. altitude. But the greatest part of the basin is covered with a šibljak-like usually very open bush which not infrequently changes into a thin deciduous forest in which *Quercus* cf. *lanuginosa* predominates, often accompanied by *Carpinus duinensis*, *Acer* sp. and *Fraxinus Ornus*, while *Pyrus* (*Sorbus*) *Aria* and *P.* (*Sorbus*) *torminalis* are rarer. Scattered *Abies* and *Pinus nigra* complete the picture. The usually very clear ground beneath is frequently covered with a dense tangle of *Rosa* sp. and *Rubus* sp. Also grassy meadows change with pastures rich in herbs of which, however, only few are still in bloom. Autumn colors already begin to show.

Little below the Athonos Panagia (1354 m. altitude) the Firs condense into a small thin stand which contains also the last *Pinus nigra* and *Pyrus* (*Sorbus*) *Aria* with *Juniperus foetidissima* as a new element represented by a few meagre individuals. Abundant thorny scrub is found near this chapel; besides a Rose it is particularly *Berberis cretica* which forms large thickets, but also thorny *Astragalus* characteristic of all Greek high mountains is not lacking. On the slopes above the chapel a pure and thin but close Fir forest extends upward to about 1550 m. altitude. Other admixtures are lacking in this Fir forest and of shrubs I noticed only a browsed specimen of *Lonicera*. Otherwise the undergrowth is strictly alpine.

In the afternoon we reached the Athonos Panagia and after resting we made the fairly easy ascent to the summit, where we enjoyed at sunset one of the most beautiful views imaginable; far in the west the Olympus shone in the last rays of the sinking sun and deep below the Chalidice with its three arms stretching out into the sea was gradually swallowed up by the darkness which approached with subtropical suddenness. We had to return in the dark to the chapel, guided by a fire-signal from our

guide whom we had left there with the horses. That night we spent in the comfortably heated guest-room of the chapel. The top of Mount Athos is famous for its rich herbaceous flora but it was too late in the season and most of the plants were out of bloom. Woody plants are less common, the most frequent is an *Astragalus*, and a few shrubs of a *Rhamnus* and of *Prunus prostrata* inhabits crevices of the rocks. During the following two days, collecting on the way, we returned by the same road to Karyes. From there we went back to Daphni where we had to wait three days for a steamer to Saloniki.

A few words may be said about the Fir forms of the Athos mountain. A form with pubescent branches could not be found in spite of our diligent search for it, but nevertheless we observed a great variety of forms in the lower mixed forest near the Kellia Kerasia, for the length of the leaves, the shape of their apex and their position on the branch varied in the same way as in the forest above Karyes. The Firs, however, of the upper pure stands near the Athonos Panagia were much more homogeneous, and to our surprise they could not be distinguished from the true *Abies cephalonica*. The question how this regional distribution could be explained has to remain open for the present, but these findings strengthen the belief that here also the mixture of two species is the cause of the variation.

From the 4th to the 16th of September we were occupied with pressing and drying the material collected; it was a slow process on account of the high humidity of the air and the character of the material which consisted largely of Firs and evergreen plants.

On September 17 we went by train to Drama. North of Saloniki the railroad runs through gently hilly country to the Doiran lake. Everything is bare and burnt and only few plants still flower on the slopes and harvested fields. The country along the lake is more beautiful and the lake itself was wildly agitated and showed beautiful whitecaps. In contrast to the mountainous Serbian shore the Greek shore of the lake is flat and swampy. Eastward stretches to the Struma a beautiful lowland forest ("Auwald") hardly interrupted by a low water-shed. From the train we could distinguish *Alnus glutinosa*, *Salix* in about four species, *Populus nigra*, *P. alba*, *Fraxinus* cf. *excelsior*, *F.* cf. *oxyphylla*, *Tamarix*, *Platanus orientalis*, only scattered, *Pyrus* cf. *communis*, *Ulmus* cf. *campestris*, *Juglans regia*, *Quercus* sp., *Rubus*, *Corylus*, *Cornus*; between these only thistles were blooming now and often large hillocks of *Arundo donax* could be observed. Particularly striking is the great development of vines: *Clematis* cf. *Vitalba*, *Vitis sylvestris*, *Humulus lupulus*, *Convolvulus sepium*, and *Periploca graeca* (?) climbs on the trunks up into the crowns; also *Smilax* seems to occur, but could not be distinguished with certainty. This vegetation obtains along the entire southern foot of the Belasitza (Belesh Planina) to the Struma river. There is a contrast between the luxuriant lowland wood and the mountain rising north of the railroad

abruptly from the plain to 1800 m. altitude. The lower region (southern slopes) of the Belasitza are covered with maquis and phrygana formations, while above rather extensive forests prevail, apparently Beeches, but also Firs seem to be present. As soon as the railroad has crossed the Struma river which here is fairly broad and swift, the landscape changes entirely. The lowland forests disappear entirely. Beyond Sidero-kastron (Demir-hissar) the whole somewhat hilly plain is cultivated; tobacco and cotton cover wide stretches. Lashed by the wind the whole country is enveloped in a cloud of dust. To the left appears for a short moment the short but imposing ridge of the Ali-botush Mountain and to the right one sees occasionally the Tahino Lake which is separated by a chain of low hills from the railroad. Then rises to the right the steep and apparently quite bare ridge of the Pilav tepe and soon we see our next goal tower steep and high from the plain. Its southern slopes seem to be also quite bare and only below covered with a sparse maquis vegetation. The next day we visit these slopes from Drama and find the barrenness of these slopes seen close by still more depressing and cheerless, for from a distance one is impressed by the imposing mountain, while at close view one has before the eyes only the thin, hardly 1-3 ft. high, scrub of *Quercus coccifera* and *Paliurus aculeatus* with scarcely any flowering herbs between. Only a small decumbent *Euphorbia* seemed interesting enough to be collected.

The advanced season forced us to restrict our excursions in Thracia to the two most important ones. From Drama we intended to visit the Boz-dagh chiefly to investigate which Fir (whether *Abies Borisii regis* or *A. cephalonica*) grew there, for Professor Stojanoff of Sofia had informed me that he had seen during the war Fir forests in the distance on the Boz-dagh. Another excursion we intended to make from Komotini (Gumuldzhina) into the Kodsha Jaila of the southeastern Rhodope Mountains, since Dingler had collected there about fifty years ago a Beech which in the shape of the appendages of the cupula shows a transition between *Fagus orientalis* and *F. sylvatica*. Both territories are near the Bulgarian-Greek frontier and one cannot travel there without military protection. On the strength of the letter of recommendation from the Greek Department of State and through the good offices of Mr. Wegener, chancellor of the German Consulate, the Director of the Political Department of the General Government in Saloniki, Mr. Sekkos, had advised the Generals of Drama and of Komotini of our coming who in turn recommended us to the care of the commandments of the local military posts. Otherwise we could not have undertaken these excursions.

On September 19 we went via Guredshik to Zernovo to report to the commandant there and then returned to Guredshik which is situated in the northwestern part of the Boz-dagh Mountain and whence we intended to make our excursions into the mountain.

The ride from Drama to Zernovo is very interesting for the reason that

it takes one within a very short time from the typical Mediterranean flora into the southernmost region of the Middle-European flora. At first the road runs in northwestern direction along the southern foot of the Boz-dagh through extensive tobacco fields, until the road at the western end of the massif turns into the gorge of the Derbend Deresi where it climbs up by serpentine. At the entrance into this gorge at first a meagre maquis vegetation of *Quercus coccifera* and *Paliurus aculeatus* prevails, only in the bed of the river they grow more luxuriantly together with *Rubus*, *Rosa*, *Clematis*, *Vitis sylvestris*. With increasing altitude other elements appear in the maquis of which *Acer monspessulanum* and *Carpinus duinensis* are the most important. At about 450-550 m. altitude *Quercus coccifera* becomes gradually scarcer until this species, which is more characteristic of the Mediterranean flora than any other, suddenly disappears entirely. In its stead *Fagus sylvatica* appears, at first in scattered bushes later in close stands with plentiful admixture of *Corylus avellana*, which together with some other elements form a very dense bushy wood. This wood, however, is entirely artificial, for it consists of stool-growth of trees cut down a long time ago by man: also now all the fairly thick stems are cut continuously and one sees all the time teams with long thin poles of beechwood going down to Drama.

The suddenness of this transition from the Mediterranean flora to that of Middle Europe is, of course, essentially caused by the mountainous character of the country; nevertheless it is not simply a regional division within the Mediterranean flora, as we have observed it also on the Oxya Mountain in a way in some respects similar, though in detail very different, but with this change the extension of Mediterranean formations toward the north ceases entirely. Some Mediterranean species may appear locally in favorable places, but they never combine to form characteristic formations.

The Beech appears in this gorge at a surprisingly low altitude and the transition occurs without interposition of a pronounced Oak region. The reasons for it are local climatic conditions caused by the narrowness of the gorge and the fact that its rather steep western walls are protected against a too strong effect of the sun. For in other places and even on the opposite side of the valley the conditions are quite different, as we shall see.

Directly behind Guredshik the gorge expands into the large cultivated plain of Zernovo. At the mouth of the gorge one observes on the slopes some small and open stands of *Pinus nigra*, otherwise everything is covered with a thin šibljak vegetation.

In Zernovo we stayed only a short time and returned soon to the small village of Guredshik where the commandant, Captain Stolingas, received us very hospitably. In the afternoon we investigated the steep slopes of north-north-western exposure above the village at an altitude of 800-1000 m. First we passed the much neglected cemetery which contained



FAGUS SYLVATICA L.
Forest on the Kodsha Jaila, Thracia

an *Abies* and some *Castanea vesca* and *Carpinus betulus*, apparently the remnants of a mixed Fir and hardwood forest. I did not see any other *Abies* on these slopes, probably because everything has been cut down and the Firs could not regenerate. There are also some old *Juglans regia*, while farther up the continuous exploitation makes the development of trees impossible and a dense mixed brushwood prevails in which frequently the Beech predominates, but in places where elements dominate which stand more heat and drought than the Beech the wood gives the impression of a true šibljak formation. I noted the following woody plants on this slope: *Fagus sylvatica*, *Corylus avellana*, *Carpinus duinensis*, *Fraxinus Ornus*, *Crataegus* sp., two or three species of *Rosa*, *Cornus*, *Acer*, *Juniperus communis*, *Ligustrum vulgare*, *Pyrus* (*Sorbus*) *torminalis*, *P.* (*Sorbus*) *Aria*, *Populus nigra*, *Viburnum Lantana*, *Clematis* and a large number of herbs and perennials.

On the following day we went to Volak (on the Austrian map also called Olak), situated easterly in direction from Guredshik in the interior of the Boz-dagh. The slopes and ridges of mostly southern, southeastern or southwestern exposure on which the road runs uphill and downhill, are almost exclusively covered with a thin or occasionally denser šibljak vegetation consisting only of elements which stand heat and sun, while Beech and similar species are lacking entirely. The essential elements are *Juniperus Oxycedrus* (very common), *J. communis* (rarer), *Carpinus duinensis*, *Acer monspessulanum*, *Fraxinus Ornus*, *Quercus lanuginosa*, and farther toward Volak we meet for the first time on the journey *Syringa vulgaris* which forms at about 1000 m. altitude on the slopes of a small dry side valley fairly extensive growths. A solitary *Quercus coccifera* grown into a small tree not far from Guredshik reminds us once more that the Mediterranean region ends here. The last limestone ridge about 1100–1200 m. altitude which we have to cross before reaching Volak is nearly devoid of shrubs but instead covered with an interesting heath-like rock vegetation ("Felsenheide") consisting of *Artemisia*, *Achillea*, *Anthemis*, *Satureja*, *Minuartia verna*, *M. setacea* and others.

These slopes belong to the same valley system and to the same altitude (about 850–1200 m. according to the Austrian map) as those of which we described above the Beech brush-wood, but they are exposed to the South, while the Beech slopes are of northern, northeastern and eastern exposure. In addition to this there is a not unimportant topographical difference; the Beech slopes are much steeper and situated directly above the brook of the Derbend Deresi (Kopatshikovitzsa) which even during the summer carries some water. Therefore they are protected against the rays of the sun and benefit by the evaporation of the brook. The slopes, however, which we are traversing now are more gently curved and thus deprived of the beneficial influence of the brooklet and are, moreover, exposed to the pitiless rays of the southern sun. These small differences in the situation cause the purely Middle-European Beech forest to extend

farther down than the šibljak formation which is for this region more characteristic. According to their summer temperature these slopes would be suitable to sustain *Quercus coccifera* maquis, but this is excluded probably by the low winter-temperature which reigns in this region. During the winter the country down to Guredshik seems to be covered for a long time with snow which induces one part of the inhabitants to move for the winter into the Thracian plain.

Volak is not, as represented on the Austrian map, situated on the slope of one of the summits of the Boz-dagh, but west of the village where a chain of hills separates it from the Derbend Deresi and its tributaries. It lies therefore in a long and broad basin nearly filled out by the talus-cones of the adjoining high mountains united under the name Boz-dagh. According to the Austrian map its altitude is 1200 m., but this seems to be too high. If the altitude for Guredshik is correct, then that for Volak would be only about 1000. The teacher of the village gave the altitude as 820 m., but I do not know upon which measurement this figure is based.

I tried now to obtain information regarding the Fir forest in the mountains, since from below one could see only hard-wood forests. All the inhabitants said that there were no Firs in the whole mountain, but finally I asked the head of the village council and he gave me the necessary directions. The next morning we started out accompanied by a heavily armed gendarme (chorophylax) to ascend the Boz-dagh.

Slowly ascending our road lead us first on to the talus-cone which fills the valley toward southwest. Round the village all the ground is cultivated, chiefly maize and tobacco, which now are already harvested; the fields are very stony. Farther up šibljak-like formations prevail, in which *Juniperus communis* and *J. Oxycedrus* play the major part, intermixed with *Prunus spinosa*, *Cornus*, *Acer campestre*, *Rosa* etc. Later scattered smaller and larger trees of *Pinus nigra* enter into this formation. After about an hour we leave the valley and turning to the right we ascend the slope of the southwestern ridge by an often very steep zig-zag path. With the beginning of the firm rock the vegetation changes entirely. The whole slope is covered with a dense hardwood forest, which, however, on account of human interference, has assumed the character of a brush-wood. It is to a great extent pure Beech forest plentifully interspersed with *Corylus avellana*, and the whole wood presents the appearance of a uniform mixed wood of Beech and Hazel. This wood is impenetrable and only along the roadside one notices some Roses as additional shrubs. But in other places, as we shall see later on, the wood may contain a greater number of other shrubs. At about 1500 m. altitude there appear some clearings in the forest where *Pinus nigra* has established itself, so that the upper region represents a mixed forest of Beech and Pine which, however, occupies only a narrow zone, for soon the Beech disappears and the Pine forms open or occasionally dense stands frequently inter-

rupted by clearings which are occupied by grassy meadows or covered with a heath-like vegetation on rubble or rock consisting over wide stretches of an *Artemisia* (see plate 8).

Pinus nigra forms the forest and tree line at an altitude which varies on the several summits between 1650 and 1750 m. Above the tree line everything is much browsed and the slopes are much modified by numerous cattle paths which lie in close proximity one above the other. Shrubs are only sparingly seen as low bushes, occasionally a *Pyrus* (*Sorbus*) *Aria* and a *Cotoneaster*, otherwise only *Thymus* and a *Globularia*. At 1700 m. altitude the meadows rich in herbs and poor in grasses are replaced by two grasses, *Festuca* and cf. *Brachypodium*, which grow in hillocks and have leaves so hard that they are not eaten by the sheep. In these hard cushions which cover whole hillsides some pretty perennials find protection from the teeth of voracious animals. Toward the summit this grass formation reaches an upper limit and is replaced by herbs and perennials (*Androsace*, *Saxifraga* and others) which grow plentifully as open formations in the rubble and gravel and in the crevices.

We did not return on the ridge along the valley of Volak, but descended directly into the end of the valley which is closed by a slope rising abruptly and very steeply. From the upper crest of this slope starts the ridge on which we made the ascent in the morning through the Beech forest. From the south a similar valley has eaten itself into the mountain and this watershed forms a not very broad crest from which one has on two sides extensive views. Particularly interesting is the view into the deep and broad, basin-like valley of Volak. The steep incline just before us is treeless, the slopes of northern exposure to the left bear the Beech forest and above the Pine forest, but the slope to the right which is exposed to the sun during the whole day is down to the bottom of the valley covered with a very thin stand of *Pinus nigra* which are placed so far apart that one can hardly speak of a forest but rather of solitary trees. These two opposite slopes do not differ in their grade nor in the subsoil, only the exposure seems to produce the great difference in their vegetation.

Where the Beech forest stops at the foot of the steep incline at the end of the valley, some Firs are said to occur between the Beeches. Therefore, we have to descend the steep slope. First we pass the large hillocks of grass between which with other herbs rise some gigantic Umbelliferae. Then we notice large patches of dark green color with small evergreen leaves and red berries: *Vaccinium Vitis-idaea* which we hardly expected here. Soon we meet low scrub of Roses with red and black fruits and here and there one sees a dwarf shrub of *Pyrus* cf. *Aria* and a few *Pinus nigra* appear. As soon as the grade becomes less steep we have to go through a very dense brush-wood of *Corylus avellana*, before we reach the mixed forest. Already we noticed some large Firs over-topping the Beeches, but they are only a few, hardly a dozen, which here in that extreme corner of the forest (about 1400 m. alt.) could save themselves

from the axe. On the relationship of this Fir I shall report later; it is very probable that it belongs to *Abies Borisii regis*. The Beeches are here fairly tall but still bushy and form a very dense and impenetrable wood. Between the many slender stems of the Beech scattered young Firs and many low shrubs are crowded, as: two species of *Evonymus*, *Pyrus* (*Sorbus*) *torminalis*, *P. cf. domestica*, *Viburnum*, *Rosa*, *Corylus*, *Lonicera*, *Cornus* and at the margin *Acer campestre* and *Clematis cf. Vitalba*.

The valley forms an upper level here and its bottom is groove-like incised between the two widely diverging slopes. This groove sharply separates Beech and Pine. On one side is the dense Beech wood and the first step out of it brings us in a heath-like formation ("Felsenheide") which over wide stretches consists here again of an *Artemisia* and alternating with the hillock grasses occupies large areas between the scattered Pines. Somewhat farther down the valley bottom becomes moister and the Beech wood extends over the whole narrow valley bottom and harbors, thanks to this moisture, a luxuriant herbaceous flora. But this condition prevails only for a short distance, for soon the valley becomes broader and the talus-cone which we already know begins; here and there one sees some scattered Pines, but they too soon disappear and the last part of our way leads us again through the šibljak vegetation which we had passed already in the morning. The above mentioned swampy condition is only local and nowhere leads to the origin of a spring and much less of a brook. Even the shepherd who has established himself near the Firs has to bring up his drinking water from Volak. Therefore, it is not possible to explain the formation of the valley by the present water conditions.

Since we could not take our plant presses with us during this expedition on account of the uncertain conditions and the bad roads, we returned the following day to Drama. On September 24 we took the train from Drama to Komatini (Gumuldshina) little suspecting that this would be our last excursion of the year.

The ride on this railroad is much more interesting than that from Saloniki to Drama, since it crosses one part of the southern Rhodope Mountains. The low hills and the lower slopes are covered up to the entry into the mountains with the same meagre *Quercus coccifera* maquis as the corresponding regions on the Boz-dagh. The railroad climbs gradually higher and at an altitude of about 250 m. the hills are closer together and the railroad enters the valley of the Doksat tshaj. Here we leave the evergreen formations behind and *Carpinus duinensis* and *Paliurus aculeatus* prevail, the former often quite pure over long stretches. Both are already resplendent with their autumn colors. At 322 m. altitude the watershed is reached and we go down to the Mesta in whose valley the most attractive part of the train ride lies. All the slopes are covered with šibljak vegetation in which the just mentioned species play the major part. Not infrequently occur also *Quercus lanuginosa*, *Q. conferta*, *Q. cerris*, *Fraxinus Ornus*, *Ligustrum vulgare*, *Cornus*, *Syringa*

vulgaris, *Juniperus* (apparently *J. communis* and *J. Oxycedrus*), *Ulmus campestris*, *Prunus spinosa*, *Pyrus amygdaliformis*. The mountains south of the railroad rise to 1351 m. and are often wooded. Among the dense foliage we seemed to recognize the white shining leaves of *Tilia tomentosa*. Near Jenikoj at 86 m. altitude the Mesta valley widens for a short distance, only to close again into a narrow gorge. In this wide section of the valley begin to appear the evergreen shrubs which came up from the South along the Mesta. The first Mediterranean shrub, we encountered, was not as might be expected *Quercus coccifera*, but *Phillyrea media* which penetrates of all Mediterranean woody plants farthest into the flora of Middle Europe. Soon, however, it is joined by *Quercus coccifera* and other shrubs. The broad bed of the brook harbors a luxuriant vegetation consisting of *Populus nigra*, *P. alba*, *Alnus glutinosa*, three or four species of *Salix* often forming extensive thickets, *Ulmus campestris*, *Platanus orientalis*, *Rubus*, *Vitis sylvestris*, *Humulus lupulus*, *Sambucus Ebulus* and others.

We enter now the eight to ten kilometers long gorge of the Mesta river. The slopes drop to the river at a very steep angle and therefore are difficult of access. Besides larger settlements seem to be lacking in the near neighborhood: these circumstances have largely preserved the natural vegetation of these slopes which seem to deserve a closer examination. A dense, though probably for edaphic reasons, rather low wood extends over all the slopes. The trees have partly low trunks, but also shrubby growth is very common. A great number of various elements seem to be represented in this wood and the whole formation gives the impression of being a mixture of maquis, šibljak, and evergreen and deciduous high forest. From the train we noted the following woody plants: *Quercus coccifera*, *Q. lanuginosa*, *Phillyrea media*, *Olea europaea* (wild form), *Pistacia Terebinthus* (also *P. Lentiscus* but we are not certain, though we believed we recognized it sometimes), *Ficus Carica* (mostly shrubby), *Erica arborea*, *E. verticillata*, *Juniperus Oxycedrus*, *Cercis Siliquastrum*, *Cistus* cf. *creticus*, *Syringa vulgaris*, *Fraxinus Ornus*, *Rosa* sp., *Coronilla emeroides*, *Paliurus aculeatus*, *Rubus*, *Ephedra campylopoda*, *Clematis*, *Vitis sylvestris* and doubtfully *Celtis* and *Arbutus*. It is terrible to observe how *Robinia pseudoacacia* intrudes every where, particularly along the railroads and the water-courses, into the natural formations; it has ruined phytogeographically the whole valley of the Varda in southern Serbia.

The gorge ends at Taxotai (Oktshihar) and here the railroad turning toward east leaves the valley of the Mesta and at the same time emerges from the mountains and runs along the southern foot of the Rhodope Mountains, crossing gentle hills which occasionally nearly flat, are apparently the talus-cones of the mountains. From the spot where we left the mountains almost to Xanthi a true heath formation covers all the hills crossed by the railroad; they are tinged bright rose by *Erica verticillata* which is in full bloom, with red-brown patches between formed by *E. arborea* which is not in blossom now. I have never seen in the Balkan

peninsula these two species of *Erica* covering such an extensive area without admixture of other elements. Then follow large growths of *Paliurus aculeatus*, but round Xanthi there are only tobacco fields. The northern end of the lake Buru Golo, which the railroad approaches rather closely is surrounded by lowland forest consisting of the usual elements. Afterward the railroad runs nearer to the mountains of which the lower slopes sustain a meagre phrygana formation and then again through tobacco plantations, harvested fields, pastures and extensive thickets of *Paliurus*. In the fields one notices frequently Mulberry and Walnut trees and scattered Oaks and *Pyrus amygdaliformis*. At the left the Karlyk Mountain 1900 m. high rises steep from the plain; the lower slopes and its spurs are covered with a *Quercus coccifera* maquis; over it follow Oak forests and above appear coniferous forests which according to information received afterward in Komotini consists of Pine (pefki, probably *Pinus nigra*). Firs are said not to occur there, but this is certainly an error, for Dingler has collected *Abies alba* on the Karlyk, and recently I received from Professor Stojanoff *Abies Borisii regis* from the same mountain, though from the Bulgarian side.

The two following days we spent at Komotini attending to the formalities with the authorities and caring for our collections from the Boz-dagh. On September 27 we started on a four days excursion to Kodsha Jaila. The first station was Puntviran (Putviran, Uecuren) situated east-north-east of Komotini in the mountains and in the valley of the Uzon Oluk Dere. Here is stationed a military post where we were very kindly and hospitably received. The officers placed their horses at our disposal and provided us with a military escort for protection and guidance; also one or two officers accompanied us all the time.

The road runs from Komotini first eastward along the southern end of the Rhodope Mountains over rubble slopes and gentle hills. As soon as the vineyards are left behind, extensive very meagre and thin growths of *Paliurus aculeatus* alternate with entirely grazed meadows. Farther east the hills become higher (about 200 m.) and soon *Quercus coccifera* appears as a low shrub between the *Paliurus*, becomes gradually more frequent and soon gains the upper hand. At the same time *Juniperus Oxycedrus* becomes frequent and somewhat higher up also *J. communis*. At the beginning of the mountain the road leads rather steeply upward to about 300 m. altitude to continue at the same height above the Uzon Oluk Dere to Puntviran. As soon as the mountain begins, which consists of primary rock as far as the Kodsha Jaila, *Phillyrea media* appears and quickly becomes quite common. The slopes above the river are covered throughout with this maquis of *Quercus* and *Phillyrea* in which *Paliurus* is much repressed. On the other hand *Carpinus duinensis* is rather common and also *Pistacia Terebinthus* is not rare. At an altitude of 250 m. some high-stemmed deciduous Oaks, *Quercus conferta* and another probably a form of *Q. lanuginosa*, appear. At the same time elements

of the šibljak formation enter into the maquis, particularly *Acer monspessulanum* and *Fraxinus Ornus*, but the character of the true maquis formation is maintained up to Putviran (about 300 m. altitude and 5 kilometers distant from the mountains).

Putviran is situated at the border, which is of course labile, between the Mediterranean maquis and the Illyrian-Pontic Oak zone. Of this fact we saw a particularly instructive illustration when we were invited for a horseback ride to Karidere, some kilometres northwest of Puntviran. We went from Puntviran at first deep down to the river and then as high up and somewhat down again. On the ridge and on the slopes a mostly high Oak forest forms a more or less open upper story; *Quercus lanuginosa* *Q. conferta*, *Q. cerris* and perhaps a fourth species are growing variously mixed and represented by forms which would need a study of weeks to interpret them. The undergrowth, however, still consists mostly of maquis vegetation chiefly formed by *Phillyrea media*, while *Quercus coccifera* has become of less importance. Of evergreen elements only *Pistacia Terebinthus* joins these two, if we disregard the two species of Juniper mentioned above. Of deciduous species are again frequent: *Carpinus duinensis*, *Acer monspessulanum* and *Fraxinus Ornus*. Sometimes, particularly on steeper places, the Oaks are lacking and then the maquis formation predominates. On the other hand the Oak forest sometimes becomes so dense, that no space and no light is left for the evergreen maquis shrubs. On the river itself Lombardy Poplars, Willows and Alders have established themselves.

The same conditions were observed, as we rode the following day from Puntviran in the valley of the Uzon Oluk Dere northward. Already a few hundred meters behind the village *Quercus coccifera* stops entirely and leaves the field to *Phillyrea media* in company with the already mentioned šibljak shrubs. Also *Quercus lanuginosa* is not rare in shrubby form. The deciduous Oaks appear now more frequently as high-stemmed trees and form denser and more continuous forests which consist chiefly of *Quercus conferta* and a species similar to *Q. sessiliflora*, while *Q. cerris* appears only scattered as an incidental element.

The road crosses many gorge-like side-valleys in a steady up and down. In these somewhat moist and shade gorges exists a particularly luxuriant vegetation. Remarkably regularly appears in such places *Juglans regia* which otherwise is lacking in the forest, and nearly with certainty one can expect here some Figs, but always as a shrub never as a tree. In general one finds this tree in Thracia in places where it grows wild or naturalized mostly always in shrubby form, while trees are seen only in gardens, as e.g., in Puntviran where the Fig still bears good fruit.

As a third new element the Grape-vine climbs over the crowns of the trees and thus strengthens the impression of particular luxuriance of the vegetation in these gorges. These three ligneous plants which enrich the localities mentioned, are most likely wild in Greece and also in a

part of the northern Balkan peninsula, but all three at the same time belong to the most important cultivated woody plants of these countries. It seems therefore in spite of their regular occurrence in the gorges, somewhat doubtful whether they are wild in these places. For just here water is present in the shape of springs or small brooks and provides inviting resting-places. It is easily imaginable that these plants owe their existence to remnants of meals thrown away by the peasants on their way to or from the market.

In contrast to these gorges the ridges projecting toward the river often end in steep cliffs and thus sunny, warm and dry localities are provided in which the mixed maquis and šibljak formation can attain its full development. It consists still of the same elements: *Phillyrea media*, *Carpinus duinensis*, *Fraxinus Ornus*, *Acer monspessulanum*, *Cornus*, *Juniperus Oxycedrus* (with *Arceuthobium*) as the chief components; besides these occur: *Pistacia Terebinthus* (beyond Puntviran already very rare), *Rubus*, *Rosa*, *Crataegus* cf. *monogyna*, *Paliurus aculeatus*, *Pyrus amygdaliformis*, *Cistus* cf. *creticus*, *Clematis* cf. *Vitalba*.

About 4-5 kilometres north of Puntviran the road descends to the river (about 200 m. altitude), which is formed here by the junction of two streams. Here ends almost abruptly the abundant shrubby vegetation. The evergreen elements disappear definitely; only the slopes of southern exposure which belong to the ridge rising rather steep in the angle between the two rivers, bear in their lower parts still abundant scrub in which *Cistus* predominates, also *Carpinus duinensis* is still there and very rarely *Phillyrea media*. This confirms the experience already made once that the last named species extends farther into the Middle-European flora than *Quercus coccifera* which on the other hand ascends in the Greek mountains to higher altitudes than *Phillyrea*. In some places *Quercus coccifera* also will push farther north, as seems to be the case on the Boz-dagh. In regard to their ecology the two species are certainly very similar, but a small difference seems to exist in so far as *Quercus coccifera* is much less particular than *Phillyrea*. Therefore in too hot and dry localities *Quercus coccifera* is not associated with its otherwise loyal companion and forms in such places solely the boundary of the Mediterranean flora in far as it concerns the ligneous vegetation. In more favorable localities, however, as near Puntviran, the *Phillyrea* seems to be more able to compete with the deciduous shrubs than *Quercus coccifera* and therefore it can advance farther than that species.

Ascending on the ridge between the two affluents of the Uzon Oluk Dere, the path turns in northeasterly direction and takes us to Hamidli (about 400 m. alt.) and then leaving this valley system we reached Tshalapi Jajlasi (about 700 m. alt.) at noon. This whole wide hilly country is exclusively dominated by Oak forests in which *Quercus conferta* and *Q.* cf. *sessiliflora* alternately predominate and form either pure or mixed woods. *Quercus lanuginosa* has become rarer, but *Q. cerris*, though still

rather rare, is found more or less regularly in scattered solitary individuals. Undergrowth is entirely lacking in these extensive woods, if one does not take into consideration the young growth of these Oaks which is present now more plentifully and now more sparingly. Only along the way one sees occasionally a Rose and of herbs there is at this season little to be seen, but the wood is often so dense that it is doubtful, if it harbors many more even at a more favorable season of the year. The Oaks are plentifully infested by *Loranthus europaeus*, often so densely, that one wonders that there are not more dying trees. The brooks are accompanied by fairly large stands of *Alnus glutinosa*.

This mountainous territory is sparsely settled and the few existing villages are small. Carriage roads do not exist and Puntviran is the terminal of the state road coming from Komotini. This circumstance alone is the reason that the large Oak forests still exist and over wide stretches are entirely untouched. I fear, however, that their years are numbered. In the immediate neighborhood of the villages the trees have been cut already. This is the case near Hamidli and Tshalapi Jajlasi, but between the two places and beyond the latter there stretch monotonous Oak forests. At the right of the path, however, also the mountains which rise up to 850 m. altitude are treeless and covered thinly with a scrub of *Juniperus communis* and *J. Oxycedrus*. Whether this is their natural condition or—what is more probable—the consequence of exploitation, I could not decide. Besides maize the inhabitants of the villages grow on their small fields some grapes which are rather sour.

After having eaten the obligatory fowl in Tshalapi Jajlasi at the house of the commandant of the place who had been advised of our coming by telephone, we continued our ride via Musadjik to Halilviran (Hebilkoj, about 950–1000 m. alt.) which we reached at nightfall. The path went several times steep down to the river and as steep up again on the other side. This very much intersected territory causes naturally a change of vegetation, though neither the formations nor their elements present anything different from what we had already seen. The slopes directly behind Tshalapi Jajlasi are perfectly bare, only when we go down to the river toward Musadjik, Oak forests appear in which *Q. conferta* predominates interspersed with *Q. cf. sessiliflora*, while *Q. lanuginosa* and *Q. cerris* are lacking. The opposite ridges bear only meagre šibljak vegetation consisting of *Juniperus communis* and *J. Oxycedrus*. A change between these few monotonous formations is all we encounter. We are not going directly to the village of Halilviran, but ascend a ridge extending down from the Kodsha Jaila (Chodja, Chodsha or Kodja Jaila or Jajla), on which a military commando is stationed where we are hospitably received. At about 800–900 m. we reach on this ridge the upper limit of the Oak forest; above it the broad arched ridge is covered with Juniper-scrub and pastures.

The following day we ascended the summit of the Kodsha Jaila (1295 m.

alt.), to which our ridge directly leads. First of all we notice that the zoning as stated above applies only to a part of the southern slope. On the northern slope follows over the Oaks first a broader or narrower zone of *Fagus*, which here forms pure and impenetrable brush-woods and above these follow the thin and interrupted scrub of the two *Junipers*. On the bare ridge we ascend slowly but steadily. Before us rises the steep and high wall of the Kodsha Jaila which its whole length and breadth is covered with Beech woods. Toward the right, i. e. toward south and southwest, we see extensive mountain ridges which do not exceed 800–900 m. altitude. These are exclusively dominated by Oak forests, while Beech is lacking entirely. If we had not traversed these mountains and their forests, it would have been difficult for us to recognize from such a distance physiognomic differences between the Beeches and the Oaks.

Soon the shrubby Beech woods extend from the south up to the ridge. As soon as we reach, at the end of the ridge, the Kodsha Jaila which runs across it, the true Beech forest begins. It is a beautiful dense high forest, and it is quite pure without admixture of any other tree (see plate 9). Numerous seedling plants form a lower shrubby story and in spite of our diligent search we are unable to detect a single shrub of another species. The individual trees form fine trunks, but yet this forest is in its appearance different from the Beech forests of Middle Europe. First of all the trunks are not quite so tall and thick as in Germany and the individual trees consists often of two or three or sometimes more stems of equal thickness arising from the very base. This cannot be the effect of cutting the original trees, for one can find in the whole forest not the slightest evidence of human activity and the officers stationed in the vicinity assured us that the forest was untouched, because it is difficult of access and no roads whatsoever exist to cart away the timber. Besides the Greek-Bulgarian border runs across the crest of the Kodsha Jaila which perhaps protects the forest more than anything else. This goes to show that the form of the forest is a perfectly natural one. As regards the height, the thickness and the division into many stems of the trees, this forest is in this respect as intermediate between the German and southern-most Beech forest on the Oxya Mountain as it is by its geographical position. The Beech forest extends nearly to the summit, but the individuals near the top assume under the influence of the wind the form of a dense many-stemmed bush and thus become similar to the Beeches of the Oxya Mountain. Only a narrow crest of the ridge is treeless. On the northern Bulgarian side a dense high Beech forest extends again far into the valleys, but the endless mountain ridges rising side by side northward from Mandritza and Ortakioj to the northern margin of the Rhodope Mountains near Svilengrad (Mustapha Pasha) which I had traversed two years ago, are completely free of Beeches. Only the higher mountains, above 1200 m. altitude, offer to the Beech here at the southeastern limit of its distribution suitable localities; even on these the tree inhabits only the uppermost

region which is yet favorable to tree growth and only occasionally *Pinus nigra* as on the Boz-dagh ascends still higher.

From Haliviran we returned not directly by the way of Musadjik, but turned toward Hadjiviran and thus had an opportunity to see on the northwest and north side of the ridge on which the above mentioned military post is situated, the lowest part of the Beech forest. At 850 m. altitude we still find beautiful dense stands of Beech, but at this altitude they include already scattered trees of *Quercus* cf. *sessiliflora*. It is a small gorge-like valley in which the Beeches descend as far down. Whether they do this also on the slopes I was unable to observe. At any rate this mixture of Beech and Oak looks strange after one has seen extensive pure stands of these two trees. Gradually the number of Beech trees diminishes at the same rate as that of the Oak trees increases and below 750–800 m. the Oak forests are again quite pure. We see here again the usual picture; everywhere Oak forests, alternating with occasional bare summits overgrown with a thin Juniper-scrub.

Now a few words regarding the chief purpose of our visit to the Kodsha Jaila which was undertaken in the hope to find here a Beech intermediate between *Fagus orientalis* and *F. sylvatica*. Although it was already rather late in the season, we succeeded in finding some trees which still bore fruit and we also could gather plenty of fruit on the ground, but much as we looked we were unable to detect any cupula with foliaceous appendages. All represented typical *Fagus sylvatica*, even if the leaves sometimes resembled somewhat those of *F. orientalis*, but the leaf characters are too unstable as to afford characteristic distinctions. We have to assume that the Beech which Dingler collected 50 years ago in these mountains was an accidental or perhaps monstrous form. In the meantime, however, Professor Stojanoff and Stefanoff have discovered (according to information in a letter) on the Bulgarian side of the Rhodope Mountain true *Fagus orientalis*. It always grows in the deep moist gorges in the Fir region, that is below *Fagus sylvatica* which grows in the higher regions of the same mountains and forms transitions to the former possibly of hybrid origin. Such an intermediate hybrid form was probably the Beech collected by Dingler. *Fagus orientalis* should be looked for on the Kodsha Jaila in the deep gorges of the Bulgarian side.

We returned to Puntviran by the same way we came and arrived in Komatini on October first. The following day we returned to Saloniki. After having pressed and dried the collected material we intended to make a hurried excursion into Bulgaria to collect at least *Abies Borisi regis* and *Fraxinus Pallisae*, but Mr. Schultz was taken vehemently sick with malaria tropica. This prevented us making the excursion and kept us in Saloniki until October 26, when he had sufficiently recovered, so that we could leave beautiful Greece, where we had been so hospitably received, and return to Berlin.

BOTANISCHES MUSEUM, BERLIN-DAHLEM

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MORUS ALBA AND ITS ALLIES IN THE HERBARIA OF
LINNAEUS, THUNBERG AND OTHERS.

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THE most important product of Japan is silk, obtained from silk-worms fed on mulberry-leaves. *Morus alba* of the present botanists and *Morus multicaulis* Perrottet are principally used for the purpose. These plants cannot be grown in the oceanic islands where they are exposed to the spray of the sea-water, but *Morus bombycis* var. *maritima* Koidzumi, *Morus Kagayamae* Koidzumi, and *Morus acidosa* Griffith are substituted for them. In Liukiu *Morus acidosa*, in Dagelet Island of the Japan Sea *Morus bombycis* var. *maritima*, and in the Idzu Archipelago *Morus Kagayamae* are used for sericulture. The Island Administration of Dagelet has made great efforts to cultivate other kinds of *Morus*, but the sea-wind has always proved fatal to the new comers.

I. LINNAEUS' MORUS

Morus alba of Linnaeus is a compound species. In *Species Plantarum*, p. 985 (1753) Linnaeus used the name *Morus alba* and the description "foliis oblique cordatis laevibus" which he already had used in his *Hortus Cliffortianus*, p. 441 (1737) follows. He used also the same description in his *Flora Suecica*, p. 283 (1748). The native habitat of *Morus alba* as indicated by him differs in these three books. In *Hortus Cliffortianus* it is designated as "crescit in Italia," in *Flora Suecica* as "in China & Italia," and in *Species Plantarum* as "Habitat in China." It is certain that he had seen cultivated plants in Holland, before he had written his *Hortus Cliffortianus*. These may have been conspecific with the white-fruited *Morus* cultivated in South Eutopia for sericulture, and which is generally considered the type of Linnaeus' *Morus alba*. This is the *Morus* which R. Dodoens figured as *Morus candida* in his *Stirpium historiae pemptades*, p. 798, fig. dextra (1583), and which J. H. Bauhin called *Morus alba* in his *Historia Plantarum Universalis*, I. 120 (1650). Linnaeus had the Chinese specimens of *Morus* collected by Pehr Osbeck, but it is quite uncertain whether he had seen them before the publication of his *Flora Suecica*. He had them when he wrote his *Species Plantarum*. According to my opinion, at the time of the publication of *Species Plantarum*, Linnaeus must have believed that *Morus alba* was not indigenous in Europe, and also that the specimens of Osbeck were conspecific with *Morus alba* of Bauhin. Therefore he concluded that *Morus alba* is a native of China, not of Europe. Linnaeus' specimens are in the rooms of the Linnaean Society of London and in Riksmuseet at Frescati near Stockholm. The specimens of *Morus alba* in the Linnaean Society consist of four fruiting branchlets and a sterile one. The one specimen in Riksmuseet is sterile. The four pieces of fertile branchlets belong to the same species, *Morus alba*; they differ from the sterile

branches both in the Linnaean Society of London and in Riksmuseet at Frescati. The sterile branches have stiff-haired petioles and veins as we see them in *Morus acidosa*; the leaves are broad and have roundish dentations. These branches represent a distinct species, but without flowers and fruits we cannot tell whether they are a species or a hybrid of known species. This question requires further investigation, hence for the fertile specimens the name of *Morus alba* should be retained for present. *Morus italica* of Poiret (in Lamarck, Encyl. Méth. iv. 377, no. 3 [1796]) resembles the sterile branches yet the leaves are more softly and densely hairy.

The specimen of *Morus tatarica* consists of one fruiting branch, collected at Assoff (Azow near the mouth of the river Don). It has reddish-brown biennial branches and annual branches with short yet spreading hairs, long adpressed-velutinous petioles, ovate or elliptic leaves with coarse serrations and perfectly glabrous veins, nearly roundish clusters of fruits, and two stigmas without style. This is nearest to *Morus tatarica* figured by Pallas in his Flora Rossica I. pt. 2, t. 52 (1788). Thunberg had a specimen sent by Pallas which Pallas collected in Tauria (Crimea of to-day). It is a fruiting specimen just like the figure of Pallas. The British Museum has nearly all the collections of Pallas, but *Morus tatarica* is lacking. Therefore the specimen in the Thunberg herbarium should be the type of Pallas' plant. It has grayish brown biennial and glabrous (glabrescent?) annual branchlets, the petioles pilose along the upper groove, the leaves a little broader (a few of them show the same form as the type of Bureau's *Morus alba* in the Muséum d'histoire naturelle at Paris), the main veins of the under surface of the leaves with white spreading hairs along both sides, the perianth hairy at the apex and two sessile stigmas. This is a form of the *Morus alba* of to-day. Thunberg had collected a specimen of the same kind in Japan. A part of his *Morus indica* in his Flora Japonica, p. 76 (1784) or *Morus indica* L. (the left-hand specimen in his Herbarium) is also the same kind. This kind of *Morus* has innumerable forms. It may have varied by mutation or by crossing, yet the forms of *Morus* belonging to this category have invariably hairs of the following kind: petiole with white hairs along the upper groove and the hairs along both sides of the principal veins on the under surface of the leaves white and spreading. This makes them a part of *Morus alba* L. *α. vulgaris* of E. Bureau (in C. de Candolle, Prodr. xvii. 238 [1873]). Excellent figures are given in Koidzumi's Revision of genus *Morus* (1917) and in his Synopsis specierum generis *Mori* (1923).

II. THUNBERG'S MORUS

(a) *Morus alba*, Flora Japonica, p. 71.

This is a sterile branch of *Morus bombycis* Koidzumi (in Tokyo Bot. Mag. xxix. 313 [1915]), with very sinuately cleft leaves. On the back

of the sheet it is designated as 'e Japonia: Thunberg. Incolis: Jamma Guwa.'

The vernacular name 'Yama-guma' is used throughout Japan. This species is one of the wild species of Japan and Korea and often used as a substitute of *Morus alba*.

(b) *Morus nigra*, l. c.

Thunberg had three specimens of *Morus nigra*, but none of them of Japanese origin. He recorded it as "crescit juxta Nangasaki" in his *Flora Japonica*, but what he meant is not clear.

(c) *Morus papyrifera*, l. c., p. 72.

This is *Broussonetia papyrifera* L'Hérit. Thunberg had four specimens, of which one is from Japan. It consists of two branchlets with female flowers and one sterile branch with opposite leaves.

(d) *Morus indica*, l. c., p. 76.

Thunberg had four specimens, of which two (α , β) are from Japan.

Specimen α consists of two branches; one is a fruiting branch of *Morus alba* with black berries; the other is a female flowering branch of *Morus bombycis* with the leaves not sinuate and pilose beneath.

Specimen β consists of two fruiting specimens of *Morus bombycis*.

Specimen γ is a fruiting specimen; on the back of the sheet is written "e Ceilona Thunberg." This has small tapering leaves like *Morus indica* of Roxburgh (Herb. Kew) which was collected by Mace at Coromandel. The same form was found by J. D. Hooker in Sikkim (Herb. Kew). In Muséum d'histoire naturelle at Paris there are three similar specimens: 1°, from Coromandel, Herb. Commerson; 2°, without locality, Herb. Jussieu; 3°, from India, without precise locality, collection of Jacquemont's voyage. The type of *Morus acidosa* Griffith (Herb. Kew) has much smaller dimorphic leaves, yet it is conspecific with *Morus indica* Roxburgh (non Linnaeus). Similar forms were collected by G. Watt at the eastern frontier of India (Herb. Kew), and by Leschenault in Ceylon (Herb. Mus. Hist. Nat. Paris). C. Schneider says (in Sargent, Pl. Wilson. III. 294 [1916]), "there is no indication of a *Morus* in any Flora of Ceylon." But we cannot overlook the existence of *Morus acidosa* in Ceylon as confirmed by the specimens of Thunberg and Leschenault. Bureau already recorded the Leschenault's specimen (in C. de Candolle, Prodr. XVII. 243, [1873]). It is unfortunate that *Morus australis* of Poiret (in Lamarck, Encycl. Méth. IV. 380, no. 9 [1796]) was reduced to *Broussonetia papyrifera* by Ed. Bureau (in C. de Candolle, Prodr. XVII. 248 [1873]) and in Ind. Kew. II. 266. C. Schneider (in Sargent, Pl. Wilson. III. 302, [1916]) considered it conspecific with *Morus latifolia* Poiret and *Morus intermedia* Perrottet, but this *Morus australis* is the oldest and valid name of *Morus acidosa* Griffith. The type-specimen consists of two fruiting branchlets. Poiret said that this was cultivated in the island of Bourbon. On the label Poiret wrote "*Morus australis*

Dic. no. 9." Linnaeus cited Rheede's *Tinda Parua* (Hort. Malabar. 1. 87, fig. 49 [1686]) as a synonym of *Morus indica* in his *Flora Zeylanica*, 160 (1747), and in his *Species Plantarum*, 986 (1753). Other authors copied it: e. g. Willdenow, *Species Plantarum* iv. 370 (1805); Spach, *Histoire naturelle des végétaux*, xi. 47 (1842). The correct citation for *Tinda Parua*, however, is not figure 49 but fig. 48. It is not a *Morus* but *Streblus asper* Loureiro, *Flora Cochinchinensis*, 615 (1790). Since Linnaeus' *Morus indica* was based on Van Rheede's figure, it cannot be used as a name for a *Morus*. There is no specimen of *Morus indica* in the Linnaean Herbarium in the Linnaean Society of London nor in Riksmuseet at Frescati.

Specimen ♂ consists of two flowering female branches of *Morus acidosa* or *Morus australis* with very large leaves, but one of which has a lateral branch with leaves similar to the type of *Morus acidosa*. These were collected by Rottler at Coromandel.

Besides, Thunberg had one more Japanese specimen. He wrote "*Morus tatarica* L. e Japonia, C. P. Thunberg" on the sheet. It is a sterile branch with small leaves. The hairs on the main veins are very much like those of sterile branches of *Morus alba* of Linnaeus, but the upper surface of the leaves is sparingly setulose. Maximowicz had labelled it as "*Morus alba* L. var. *stylosa* Bureau" which includes *Morus indica* and *Morus bombycis*.

Morus Tokwa Siebold in the Rijksherbarium at Leiden is, as Miquel remarked (Prol. Fl. Jap. 130, [1867]), conspecific with *Morus multicaulis* Perrottet or *Morus latifolia* Poiret (in Lamarck, *Encycl. Méth.* iv. 381 [1796]). The specimens of *Morus Tokwa* are fruiting branches. *Morus latifolia* was sent to Lamarck by an unknown collector from the island of Bourbon where it was cultivated. The specimen consists of a sterile branch.

SUMMARY

(1) *Morus alba* of Linnaeus consists of two species; one is *Morus alba* of to-day and the other is an unknown species. The name of *Morus alba* should be retained for the former.

(2) *Morus tatarica* of the Linnaean Herbarium in London is distinct from *Morus alba*. *Morus tatarica* of Pallas is *Morus alba* Linnaeus.

(3) *Morus alba* of Thunberg is *Morus bombycis* Koidzumi.

(4) *Morus indica* of Thunberg from Japan is *Morus bombycis* Koidzumi, and from other countries it is *Morus australis* Poiret (*M. acidosa* Griffith).

(5) *Morus latifolia* Poiret is the earliest valid name of *Morus Tokwa* Siebold and *Morus multicaulis* Perrottet.

DESCRIPTION OF A NEW SPECIES

Morus scabriuscula Nakai, sp. nov.

Frutex; rami biennes rubescenti-grisei, glabri, lenticellis rotundatis vel elongatis punctati; rami hornotini virides, pilis albis tenuissimis adpresse pilosi; gemmae ovatae, squamis fuscis imbricatis obtectae. Stipulae subulatae vel lanceolato-subulatae, circiter 5 mm. longae, extus totae vel in medio ciliatae, intus glabrae; petioli circiter 1 cm. longi, toti tenuissime aequaliter piloselli; lamina inaequaliter triloba vel raro indivisa, interdum subquineloba, basi cordata, margine leviter incurvato-ovato-serrata, apice acuminata vel caudato-attenuata, supra viridis, glabra sed papillis cartilagineis sphaericis vel setulosis aspera vel scabra, infra pallida, venis primariis dorso sparsissime pilosis et circa basin ad latera patentim barbatis exceptis glabra. Flores masculi mihi ignoti; inflorescentia feminea brevissima, ambitu subrotundata; pedunculi minute tenuissime ciliati, 5-7 mm. longi; tepala dilatata apice ad marginem tantum pilosa, viridia, integra, rarius inferiora biloba; ovarium glabrum; stylus nullus; stigmata 2, incurva, intus papillosa.

In agris japonensibus rara.

I saw only one specimen of this new species in European herbaria. It is preserved in the Herbarium of the University of Upsala, Sweden, and was collected by J. F. Eijkman at Nagasaki.

BOTANICAL INSTITUTE OF TOKYO IMP. UNIVERSITY

KOISHIKAWA, TOKYO

May, 1927

AN ENUMERATION OF THE LIGNEOUS PLANTS OF ANHWEI

ALFRED REHDER AND ERNEST H. WILSON

SUPPLEMENT

Juniperus formosana Hay. (p. 90); strike out no. 3023, which belongs to *Stewartia chinensis* Rehd. & Wils. No. 3023 may be a mistake for no. 3027 or 3029, numbers wanting in our herbarium, and if so, it was collected on the Wang shan, July 15, 1925.

Carpinus laxiflora var. **Davidii** Franch. (p. 95); add:

Li kan, Chemen, alt. 100 m., *R. C. Ching*, no. 3156, August 7, 1925 (tree 15 m. tall, diam. 55 cm.).

Castanea Henryi Rehd. & Wils. (p. 96); strike out no. 4101 which should be changed to 4181 and is from Chekiang, not from Anhwei.

Before **Michelia figo** (p. 110) insert:

Manglietia Fordiana Oliver in Hooker's Icon. xx. t. 1953 (1891).

Wang shan, alt. 550 m., *R. C. Ching*, no. 2946, July 12, 1925 (tree 9 m. tall).

After *Benzoin reflexum* (p. 113) insert:

Benzoin erythrocarpum Rehder in Jour. Arnold Arb. i. 144 (1919).

Lindera erythrocarpa Makino in Tokyo Bot. Mag. xi. (219) (1897); xiii. 138 (1899).

Lindera Thunbergii, op. cit. xiv. 184 (1900).—Non *Benzoin Thunbergii* Sieb. & Zucc.

Chemen, *R. C. Ching*, no. 3198, August 13, 1925 (tree 9 m. tall, diam. of trunk 25 cm.; fruit bright red).

This species has not yet been recorded from China as far as I know. The specimen agrees well with specimens from Ogawa, Shinano province, Japan, collected by J. G. Jack, except that the leaves are scarcely glaucescent beneath.

Benzoin strychnifolium Kuntze (p. 113); add:

Chu hwa shan, north foot, alt. 300 m., *R. C. Ching*, no. 2768, June 26, 1925 (shrub 5 m. tall).

After *Benzoin strychnifolium* (p. 113), add:

Benzoin spec.

Chu hwa shan, *R. C. Ching*, no. 2595, April 28, 1925 (small tree 9 m. tall); Tien tai shan, alt. 1220 m., *R. C. Ching*, no. 2853, June 29, 1925 (tree 12 m., diam. of trunk 25 cm.)

The specimens cited above are characterized by the strongly lenticellate branches and the dense, villous, scarcely silky pubescence of the young unfolding leaves of the flowering specimen; no. 2853 which is in young fruit has its elliptic-lanceolate leaves only slightly pubescent on the veins and very sparingly on the veinlets. I have not been able to identify these specimens with any *Benzoin* known to me and have to defer final determination until mature fruit is available.

After *Rosa sertata* (p. 125) insert:

Maddenia hypoleuca Koehne in Sargent, Pl. Wilson. i. 56 (1911).

Chu hwa shan, *R. C. Ching*, no. 2727, May 3, 1925.

Zanthoxylum setosum Hemsl. (p. 150); add:

Chu hwa shan, *R. C. Ching*, no. 2725, May 3, 1925.

Evodia officinalis Dode (p. 151); add:

Chu hwa shan, *R. C. Ching*, no. 2779B, June 27, 1925 (dense shrub, 5 m. tall; bark grey; common).

Securinega ramiflora Müll. Arg. (p. 152); add:

Chu hwa shan, *R. C. Ching*, no. 2723, May 3, 1925.

Ilex purpurea Hassk. (p. 156); in the enumeration of specimens for "*R. C. Ching*, no. 3722" read "*R. C. Ching*, no. 3172."

Paliurus hirsutus Hemsl. (p. 165); in the first line of the last paragraph for "12-14 m. across" read "12-14 mm. across."

After *Berchemia Giraladiana* (p. 166) insert:

Berchemia floribunda Brongniart in Ann. Sci. Nat. x. 357, t. 13, fig. 1. (Mém. Fam. Rhamn. 50) (1826).

Berchemia floribunda var. *megalophylla* Schneider in Sargent, Pl. Wilson. II. 213 (1914).

Chu hwa shan, *R. C. Ching*, no. 2724, May 3, 1925.

The specimen cited above differs somewhat from the six Indian specimens before me in the narrower gradually acuminate leaves green beneath and in the more leafy inflorescence, but otherwise I can see no difference. I also am unable with additional Chinese material at hand to retain Schneider's var. *megalophylla*, for the size of leaves varies in the Himalayan material as much as in the Chinese, e. g. *R. R. Stewart's* no. 2363 from Chamba, Punjab, has leaves up to 11.5 cm. long, while in at least four of the eight Chinese specimens in this herbarium the leaves do not exceed 7 cm. in length.

Vitis fagifolia Hu (p. 168); add:

Chu hwa shan, alt. 300 m., *R. C. Ching*, no. 2753, June 26, 1925 (trailing vine, 2 m. long).

Vaccinium bracteatum Thunb. (p. 185); add:

South Chemen, alt. 120 m., *R. C. Ching*, no. 3201, August 13, 1925 (shrub 6 m. tall).

Callicarpa Lingii Merrill (p. 193); for "Merrill, sp. nov." read "Merrill in Jour. Arnold Arb. VIII. 16. (1927)."—By mistake the original description accompanying the type specimen, which was loaned by Dr. E. D. Merrill to the Arnold Arboretum, was published a second time as a new species.

Gardenia augusta Merrill (p. 196); add:

North foot of Chu hwa shan, alt. 300 m., *R. C. Ching*, no. 2765, June 26, 1925 (dense shrub 2.5 m. tall).

After *Viburnum theiferum* (p. 197); insert:

Viburnum lobophyllum Graebner in Bot. Jahrb. xxix. 589 (1901).—Rehder in Sargent, Trees & Shrubs II. 101, t. 148 (1908).

In his letter of September 2nd Dr. H. Handel-Mazzetti informed us that he had recently received a collection of plants made by Chien on the Wang shan in Anhwei and that this collection contained a number of species not mentioned in our "Enumeration of the ligneous plants of Anhwei" of which he had seen at that time only the first part. We hope to be able in a later issue of this Journal to publish a list of the species of the Chien collection not in our Enumeration.

NOTES

The Arnold Arboretum during the Fiscal Year ended June 30, 1927.

The Arboretum.—The weather of 1926–27 was most favorable for the living collections. No very low winter temperatures were recorded and frost did not penetrate to any great depth into the ground. December brought several heavy falls of snow but those of the other winter months were moderate only. The trees and shrubs suffered little or no winter injury. Good rains fell during spring and summer. On the whole it is long since the Arboretum enjoyed so favorable a season of plant growth.

In the spring fewer plants were placed in the permanent collections than usual, the most important planting being a new *Prunus* collection among the *Betula* group on Bussey Hill.

The autumn of 1926 was marked by an abundant display of colored fruits and autumn foliage. The 1927 spring display of Japanese Cherries was finer than usual, but of the Crabapples not more than forty per cent flowered. The Azaleas, Rhododendrons, and *Kalmias* blossomed in great profusion. The collections generally are in excellent condition. The Hybrid Lilacs were very severely pruned and to the great disappointment of the general public none blossomed. Thanks to favorable season and judicious feeding, the cut-down Lilacs have made splendid growth and there is reason to expect a display of blossom next year.

During the year 3006 plants (including grafts and cuttings) and 3422 packets of seeds were distributed as follows: to the United States, 2851 plants and 1189 packets of seeds; to Great Britain, 63 plants and 489 packets of seeds; to Canada, 21 plants and 496 packets of seeds; to Australia, 1 plant and 21 packets of seeds; to Finland, 114 packets of seeds; to India, 1 packet of seeds; to Holland, 29 plants and 52 packets of seeds; to Japan, 137 packets of seeds; to Sweden, 3 plants and 220 packets of seeds; to Germany, 3 plants and 184 packets of seeds; to China, 2 plants and 106 packets of seeds; to Denmark, 115 packets of seeds; to Russia, 140 packets of seeds; to France, 10 packets of seeds; to Czechoslovakia, 148 packets of seeds; to Ireland 17 plants; to Cuba 18 plants; to Tasmania, 1 plant and to New Zealand, 1 plant.

There have been received 1911 plants (including grafts and cuttings) and 781 packets of seeds as follows: from the United States, 1730 plants and 68 packets of seeds; from Great Britain 156 plants and 110 packets of seeds; from France, 31 packets of seeds; from Germany, 2 plants and 10 packets of seeds; from China, 228 packets of seeds; from Canada, 1 plant and 40 packets of seeds; from New Zealand, 103 packets of seeds; from India, 124 packets of seeds; from Sweden 9 plants and 15 packets of seeds; from Japan, 1 packet of seed; from Czechoslovakia 2 packets

of seeds; from Russia 42 packets of seeds; from Cuba 5 plants and 7 packets of seeds; from Ireland, 5 plants and from Manchuria, 3 plants.—E. H. W.

The Herbarium.—At the end of June the Herbarium contained 285,822 sheets, 9018 sheets having been added during the year 1926–27. Among the accessions about 1650 plants came from North America, about 920 from Central and South America, more than 1200 from Europe and Western Asia, about 1,400 from tropical and southern Africa, about 800 from China and about 1800 from Malaysia and Australasia. About 500 were cultivated plants and more than 1300 miscellaneous collections. As the most important single collections received may be mentioned about 900 plants collected by E. J. Palmer chiefly in Texas, Arkansas, Oklahoma, Missouri and Wisconsin, 257 plants collected by P. Dusén in Brazil, about 1200 plants from Europe and western Asia received from J. Bornmueller, 331 plants from Fukien province collected by H. H. Chung, 372 plants from Chekiang province through the National Southeastern University of Nanking, 1085 from Borneo collected by A. D. Elmer, 406 from South Africa collected by R. Marloth, 984 plants from Tropical Africa collected by D. H. Linder, and 577 plants from Papua collected by L. J. Brass. There have been distributed from the herbarium 5970 specimens among eight institutions in this country and in Europe.

Botanical exploration for the Arnold Arboretum has been carried on in different parts of the world during the year. The expedition to northwestern China and northeastern Tibet under Mr. J. F. Rock, was brought to a successful conclusion. Mr. Rock started from Choni, Kansu, in March, 1927 and arrived safely in Shanghai at the beginning of May and by June all the collected material, botanical and zoological, had arrived at Shanghai without the loss of a single parcel (see *Journ. Arnold Arb.* VIII. 200). The collection of plants amounted to more than 5000 numbers each number with many duplicates. Mr. Rock also sent to the Arboretum 601 different numbers of plant seeds, many of them in very large quantities. These have been distributed among 41 of the leading botanical gardens in this country, Canada and northern Europe. Assistant Professor J. G. Jack spent more than three months, from the middle of January to April, 1927, at the Harvard Tropical Garden, Soledad, Cuba, collecting for the Arboretum in the Garden and in the surrounding country. Mr. J. E. Palmer collected from July to October, 1926 in Texas and some of the adjoining states and explored the botanically little known Davis Mountains in southwestern Texas. Dr. D. H. Linder accompanied as collector for the Arboretum the Expedition of the Harvard Institute of Tropical Biology and Medicine which crossed the African Continent from Liberia to British East Africa, starting in October 1926, and reaching the eastern coast in May 1927;

he collected more than 2600 numbers of plants, most of them in duplicate. Dr. Joh. Mattfeld collected in Greece from May to October 1926 (see Journ. Arnold Arb. viii. 133 and 205 for a detailed report) and started again for the Balkan peninsula in June 1927 to collect in Bulgaria. In Australia the Arboretum participated in the botanical exploration carried on by Mr. C. T. White for the Brisbane Botanic Garden. The collecting tour in the British Territory of Papua by Mr. L. J. Brass had already been terminated in June 1926.—A. R.

The Library.—Since the last report on the library made in this Journal (October, 1926) 653 volumes, 187 pamphlets and 886 photographs have been added, bringing the total to 37,146 bound volumes, 8,559 pamphlets, 200 unbound volumes of works coming out in parts, and 13,401 photographs.

The most valuable and interesting books added during the year are: MIZAULD, (*Lat.* MIZALDU.) ANTOINE. Hortorum secreta. Lutetiæ. 1575.—Fine copy bound in vellum sheet of music. Antoine Mizauld (1510–78) born at Montluçon, was astrologer and physician in ordinary to Marguerite de Navarre.

KRAFFT, J. C. Plans des plus beaux jardins pittoresques de France, d'Angleterre et d'Allemagne. 2 vol. Paris. 1809–10.—Beautiful colored plates, and trilingual text. Rare. Gift of Mrs. Edith Appleby.

The PHILADELPHIA florist (continued as FLORIST and horticultural journal). [1852–55.]

COLONNA (*Lat.* COLUMNA), Fabio. Φυτοβασανος; sive, Plantarum aliquot historiae. Neapoli. 1592.—First edition of an important and rare book of plants which was reprinted in the 18th century. Graesse says this work is the first having figures of plants engraved on copper. The plates are very fine, in a brownish tone, surrounded by a printed border. Vellum binding.

PONS, Jacques. Medicus, seu ratio, ac via aptissimus, ad recte tum discendam, tum exercendam medicinam. Lugduni. 1600.—Bound in vellum.

——— In historiam generalem plantarum Rovillii. Lugduni. 1600.—Bound in vellum.

USTERI, Paulus. Delectus opusculorum botanicorum. 2 vol. Argentorati. 1790–93.

WALCOTT, Mary V. North American wild flowers. 2 vol. 1925.—Set of beautiful colored plates. Gift of Mrs. L. A. Frothingham.

C., T. De natuerlijke beschryvingh der boomen. Amsterdam. 1663. GORDON, DERMER, AND EDMONDS. A catalogue of trees, shrubs, plants, &c. sold by [them]. 1784.—Bound in crushed levant.

LAICHARDING, J. N. Manuale botanicum, sistens plantarum europaearum characteres generum, specierum differentias, nec non earum loca natalia. Oeniponte & Lipsiæ. 1794.

- LE GENDRE, curé d'Henonville. La manière de cultiver les arbres fruitiers. Paris. 1652.—"Auctor verus est Antoine Le Maistre." *Pritzel*.
- MASSON, Francis. *Stapeliae novæ*; or, A collection of several new species of that genus, discovered in the interior parts of Africa. London. 1796.—Bound in crushed levant, with gold tooling, and having book-plate of the "Honble William Henry Irby."
- MARTYN, Thomas. Thirty-eight plates with explanations, intended to illustrate Linnaeus's System of vegetables. London. 1799.
- SCHELHAMMER, G. C. *Catalogus plantarum maximam partem rariorum, quas per hoc biennium in hortulo domestico aluit, et, paucis exceptis, etiam his vernis aestivisque mensibus poterit exhibere.* Helmstadii. 1683.
- AVRIL, P. H. *Voyage en divers états d'Europe et d'Asie.* Paris. 1692.
- THOMSON, J. A. *The new national history.* 3 vol. New York, *etc.* 1926.—Gift of Mrs. C. W. McKelvey.
- KONING, Peter. *De cortice salicis albae ejusque in medicina usu. Ex auctoritate rectoris Matthiae van Geuns.* Hardervici. 1778.
- KURSNER, Christian. *Dissertatio medica de potu theæ.* Sub præsidio J. J. Waldschmiedt. Marburgi Cattorum. 1685.
- CATALOGUE des arbres cultivez dans le verger et plan du Sieur le Lectier Procureur du Roy à Orleans. 1628 (reprinted 1925).—"Privately printed. 100 copies, no. 17."
- BOODT, Anselm Boëtius de. *Florum, herbarum ac fructuum selectiorum icones, & vires pleræq; hactenus ignotæ.* Brugis Flandrorum. 1640.
- BELL, John. *Travels from St. Petersburg in Russia to various parts of Asia.* 2 vol. Edinburgh. 1788.—Bound in calf and having book-plates of Thomas Philip Earl de Grey.
- KEATE, George. *An account of the Pelew Islands.* 2d ed. London. 1788.—Bound in tree calf, with engraved plates including portrait of Capt. Henry Wilson.
- [ROCK, J. F. *Map of northwestern China and northeastern Tibet, made during his Arnold arboretum expedition to those countries, 1924-1927.*] N.P. [1925-26.] 18 sections mounted on 3 sheets, folded in 1. f° cover.—An important contribution to a new map of China and Tibet.

The number of periodicals received in exchange for the *Journal of the Arnold arboretum* now number 168, coming from all parts of the world, including Czechoslovakia, Estland, Lettland, Rumania, China, Japan, Indo-China, Siberia, Crimea, South Africa, Australia, and New Zealand. Twenty-five new exchanges have been arranged during the year.

The photographs received include fifty-three views (many aerial) taken during the "Hamilton-Rice Seventh Expedition to the Amazon,

in conjunction with the Department of tropical medicine of Harvard University, 1924-1925," the gift of Mr. Rice, and 424 more photographs taken by Mr. Rock in China, making a total of 624 received from him. Four hundred of Mr. Rock's photographs have been mounted and added to the collection, the remainder it is hoped will be added at an early date.—E. M. T.

Expedition of the Harvard Institute of Tropical Biology and Medicine to Tropical Africa.—The chief objects of this Expedition under the leadership of Dr. R. P. Strong were to make a biological and medical survey of Liberia, and then to cross Africa through the Belgian Congo emerging on the east coast of Africa, and to make comparative studies in these tropical regions. As the expedition presented an opportunity to obtain a collection of plants from tropical Africa for the herbarium, through the generosity of the late director of the Arnold Arboretum arrangements were made by him and by Dr. Strong to have a botanist accompany the expedition to collect for the Arboretum, and Dr. D. H. Linder was appointed to fill this position. Arrangements were also made with Dr. J. Bequaert, who was on the staff of the expedition and who had previously collected plants in tropical Africa, to advise and help Dr. Linder as much as his time allowed. The other members of the expedition were Doctors George C. Shattuck, Max Theiler, Glover M. Allen, Mr. Harold J. Coolidge and Mr. Loring Whitman. The expedition reached Monrovia in the first days of July 1926 and crossed the country in three different directions. Finally returning to Monrovia, it then proceeded down the West African coast to the mouth of the Congo River, and after reaching Lake Tanganyika proceeded northward as far as Lake Albert, crossing then into Uganda and British East Africa, reaching Mombasa in June, 1927. Dr. Linder collected more than 2600 numbers of well prepared botanical specimens including those collected by Dr. Bequaert and other members of the expedition. Of many of the numbers several duplicates were collected. The herbaceous plants and the fungi of the collection were turned over to the Gray Herbarium and the Farlow Herbarium.—A. R.

ERRATA

Page 21, line 7 from the bottom for *subcaudataum* read *subcaudatum*.

“ 69, line 18 from the bottom *for* *meritorios* *read* *meritorious*.

“ 90, line 12 ~~FOR~~ *R. C. Ching* ~~READ~~ *R. C. Ching*.

“ 94, line 17 *for* *Likau* *read* *Likan*.

“ 100, line 9 from the bottom *for* *Baily* *read* *Bailey*.

“ 118, line 3 for 24643 read 2643.

“ “, line 18 for *Spirea* read *Spiraea*.

“ 166, line 4 from the bottom for *crenatus* read *crenata*.

“ 167, line 9 for *globosus* read *globosa*.

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